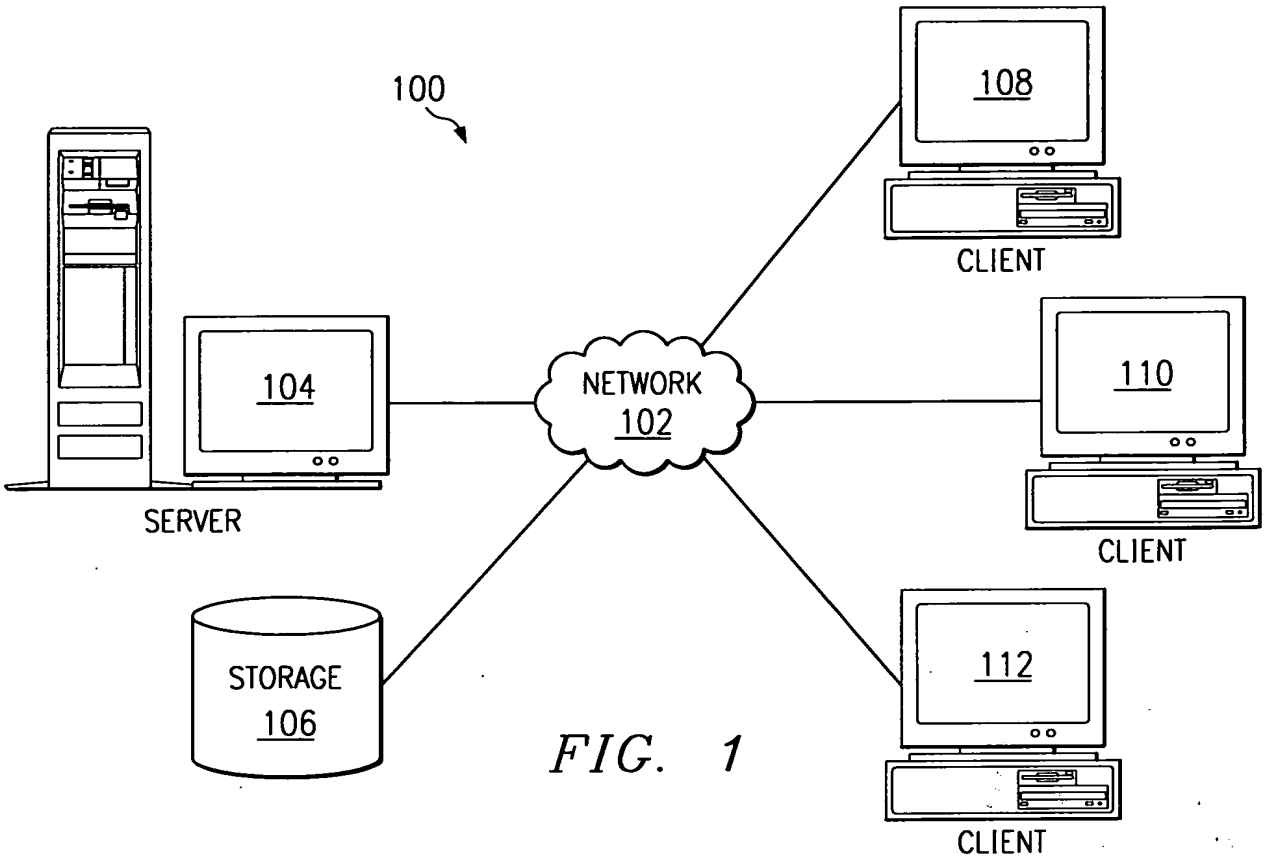

100
108
CLIENT
104
SERVER
NETWORK
102
110
CLIENT
STORAGE
106
112
CLIENT

FIG. 1

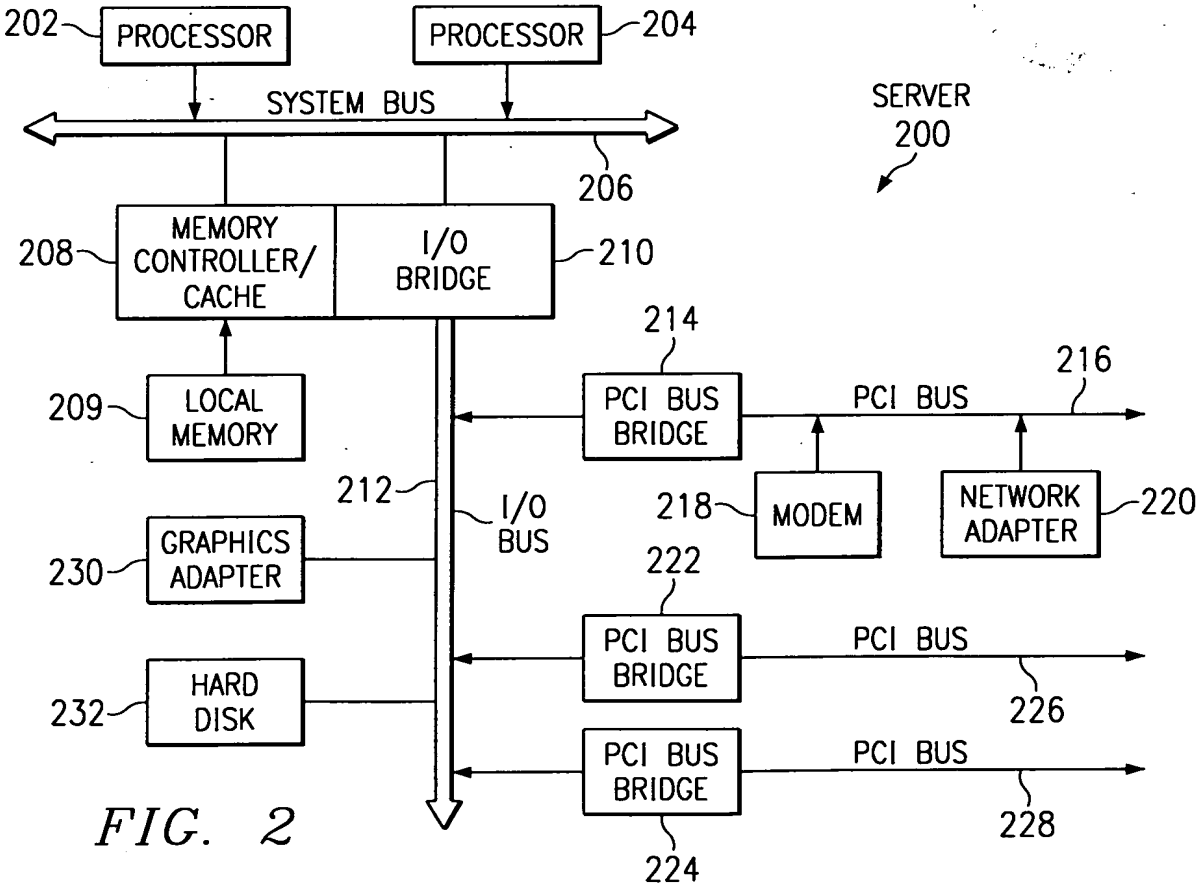

202
PROCESSOR
PROCESSOR
204
SYSTEM BUS
206
SERVER
200
208
MEMORY CONTROLLER/ CACHE
I/O BRIDGE
210
214
209
LOCAL MEMORY
PCI BUS BRIDGE
PCI BUS
216
212
I/O BUS
218
MODEM
NETWORK ADAPTER
220
230
GRAPHICS ADAPTER
222
PCI BUS BRIDGE
PCI BUS
232
HARD DISK
226
PCI BUS BRIDGE
PCI BUS
228
224

FIG. 2

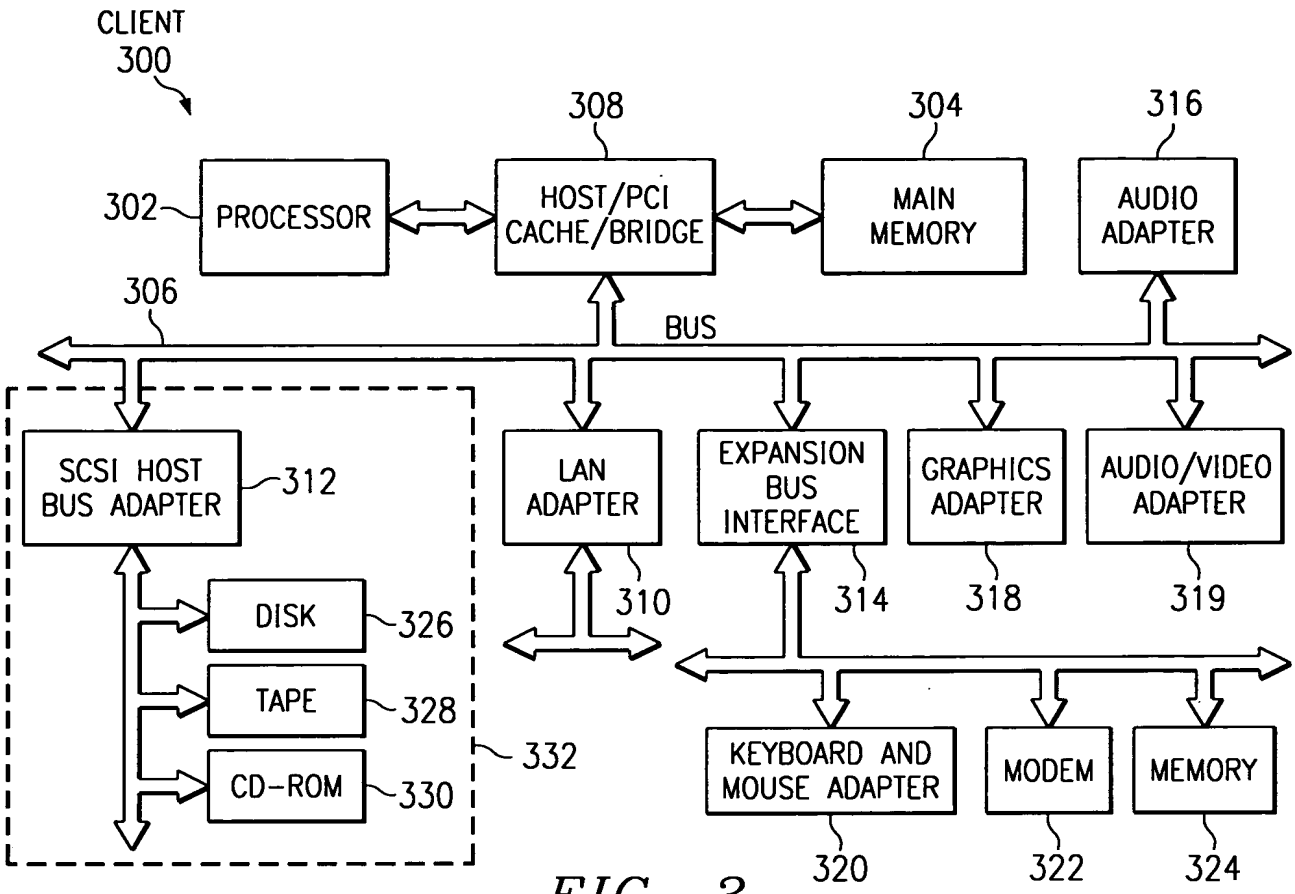

CLIENT
300
308
304
316
302
PROCESSOR
HOST/PCI
CACHE/BRIDGE
MAIN
MEMORY
AUDIO
ADAPTER
306
BUS
SCSI HOST
BUS ADAPTER
312
LAN
ADAPTER
EXPANSION
BUS
INTERFACE
GRAPHICS
ADAPTER
AUDIO/VIDEO
ADAPTER
310
314
318
319
DISK
326
TAPE
328
CD-ROM
330
332
KEYBOARD AND
MOUSE ADAPTER
MODEM
MEMORY
320
322
324

FIG. 3

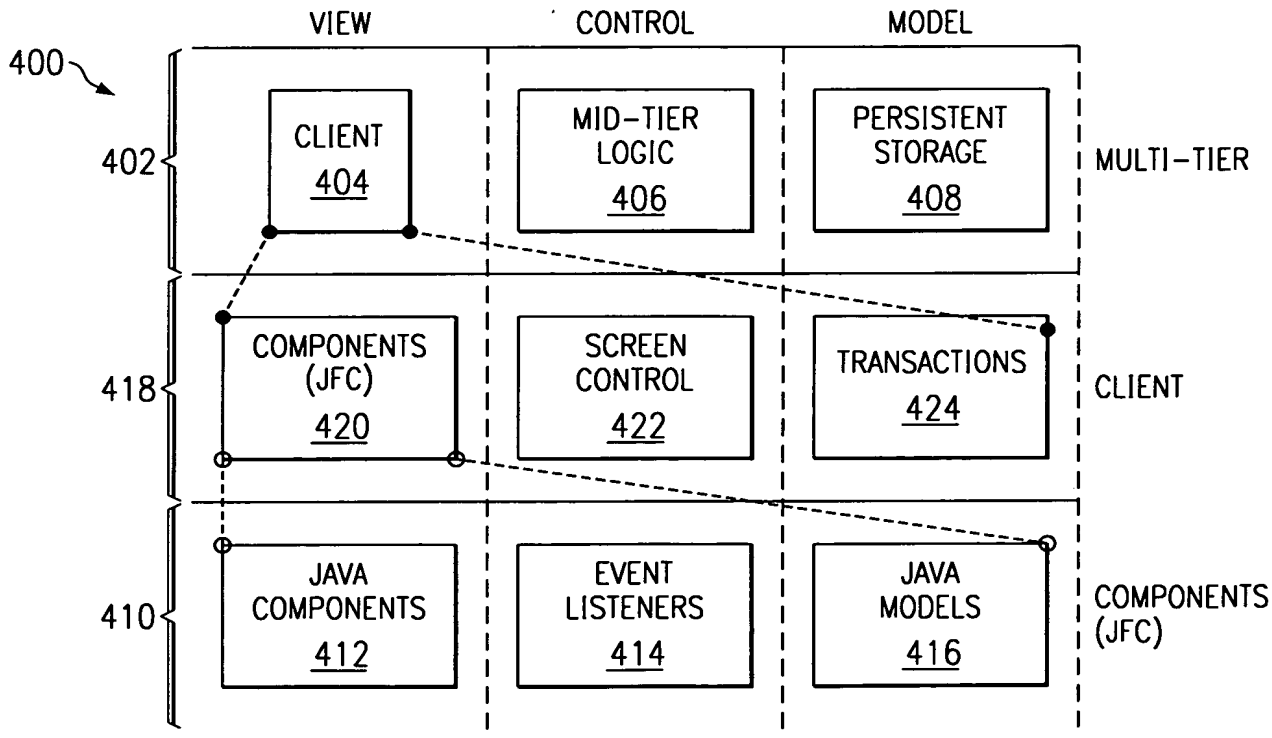
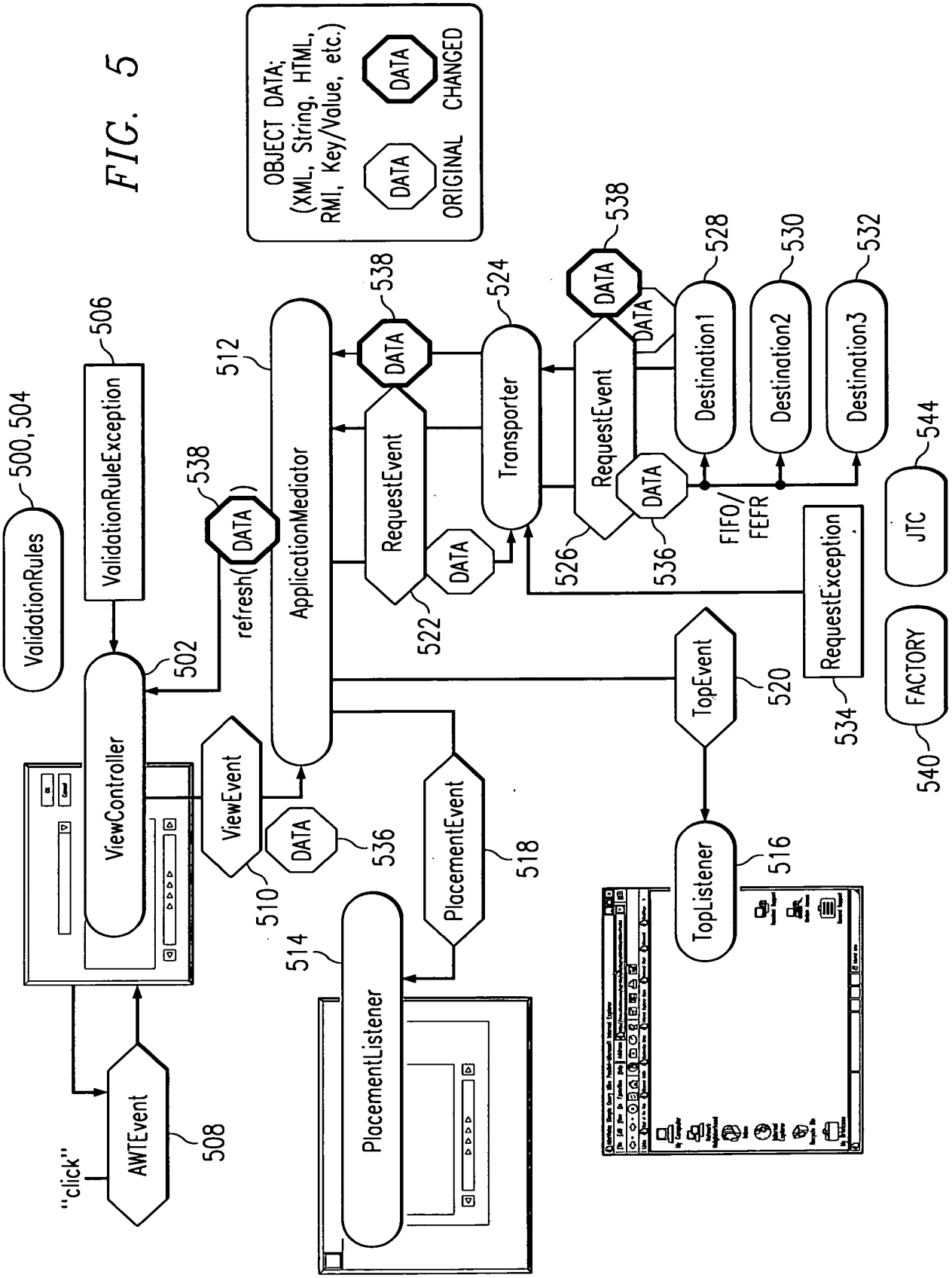

VIEW
CONTROL
MODEL
400
402
CLIENT
404
MID-TIER
LOGIC
406
PERSISTENT
STORAGE
408
MULTI-TIER
418
COMPONENTS
(JFC)
420
SCREEN
CONTROL
422
TRANSACTIONS
424
CLIENT
410
JAVA
COMPONENTS
412
EVENT
LISTENERS
414
JAVA
MODELS
416
COMPONENTS
(JFC)

FIG. 4

FIG. 5


OBJECT DATA;
(XML, String, HTML,
RMI, Key/Value, etc.)
DATA
ORIGINAL
DATA
CHANGED
500, 504
ValidationRules
506
ValidationRuleException
538
DATA
refresh(
512
ApplicationMediator
538
DATA
RequestEvent
522
DATA
524
Transporter
538
DATA
RequestEvent
DATA
526
DATA
536
528
Destination1
530
Destination2
532
Destination3
FIFO/
FEFR
534
RequestException
544
JTC
540
FACTORY
"click"
AWTEvent
508
502
ViewController
ViewEvent
510
DATA
536
514
PlacementListener
PlacementEvent
518
520
TopEvent
516
TopListener

600

Class Hierarchy

```
class java.lang.Object
    interface com.ibm.jtc.ApplicationMediator (extends com.ibm.jtc.JTC)
    class com.ibm.jtc.ApplicationMediatorImpl (implements com.ibm.jtc.ApplicationMediator,
    com.ibm.jtc.ViewListener, com.ibm.jtc.RequestResponseListener)
    interface com.ibm.jtc.Destination (extends com.ibm.jtc.JTC)
    class com.ibm.jtc.DestinationImpl (implements com.ibm.jtc.Destination)
    class java.util.EventObject (implements java.io.Serializable)
      class com.ibm.jtc.PlacementEvent (implements java.io.Serializable)
      class com.ibm.jtc.RequestEvent (implements java.io.Serializable)
      class com.ibm.jtc.TopEvent (implements java.io.Serializable)
      class com.ibm.jtc.ViewEvent (implements java.io.Serializable)
    class com.ibm.jtc.Factory (implements java.io.Serializable)
    interface com.ibm.jtc.JTC (extends java.io.Serializable)
    interface com.ibm.jtc.PlacementListener
    interface com.ibm.jtc.RequestListener
    interface com.ibm.jtc.RequestResponseListener
    class java.lang.Throwable (implements java.io.Serializable)
      class java.lang.Exception
        class com.ibm.jtc.RequestException (implements java.io.Serializable)
        class com.ibm.jtc.ValidationRuleException (implements java.io.Serializable)
    interface com.ibm.jtc.TopListener
    class com.ibm.jtc.Transporter (implements com.ibm.jtc.RequestListener, com.ibm.jtc.JTC)
    class com.ibm.jtc.ValidationRule (implements java.io.Serializable)
    interface com.ibm.jtc.ViewController (extends com.ibm.jtc.JTC)
    interface com.ibm.jtc.ViewListener
```

FIG. 6

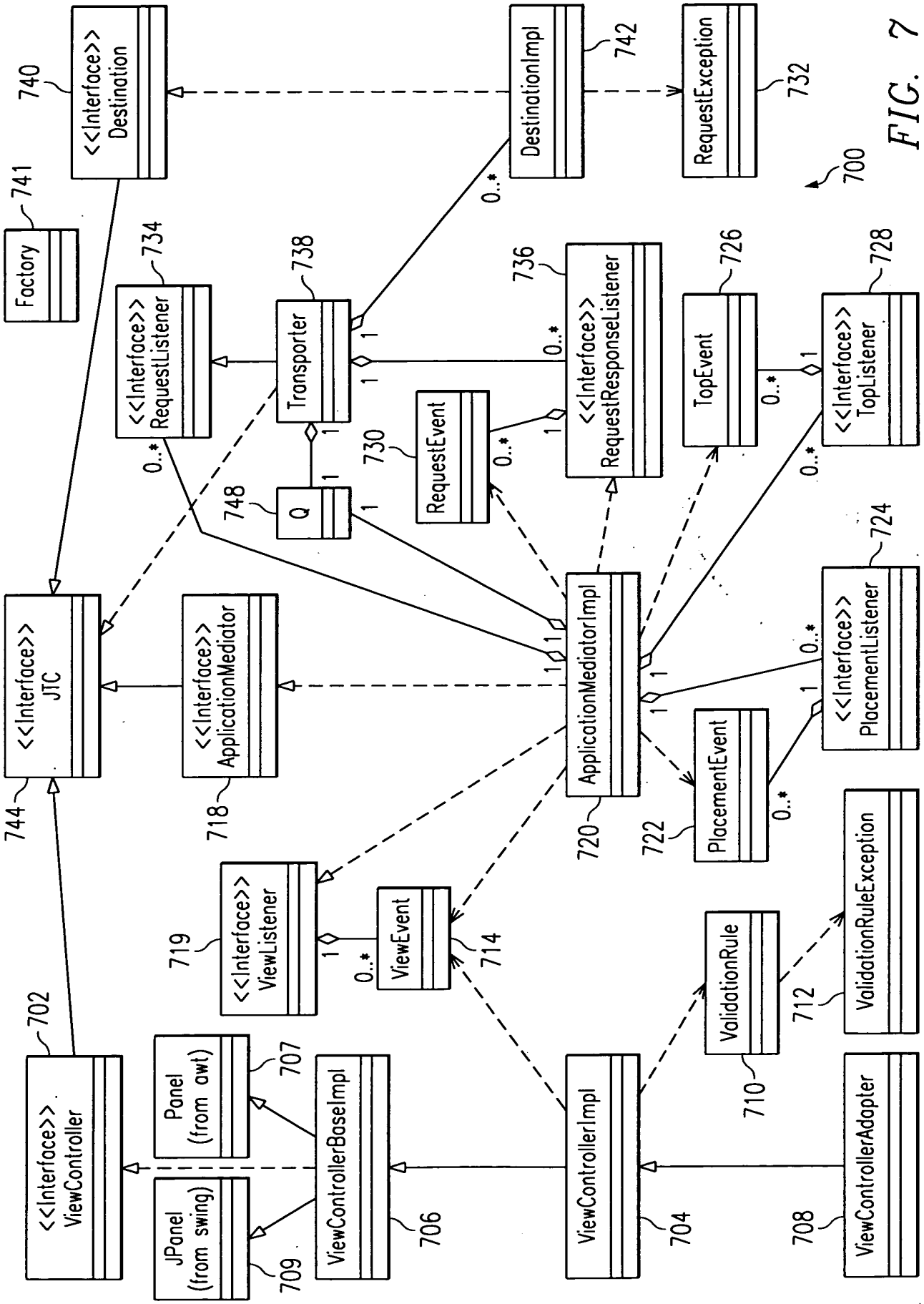

<<Interface>>
Destination
740
DestinationImpl
742
RequestException
732
700
Factory
741
<<Interface>>
RequestListener
734
Transporter
738
<<Interface>>
RequestResponseListener
736
TopEvent
726
<<Interface>>
TopListener
728
RequestEvent
730
Q
748
<<Interface>>
JTC
744
<<Interface>>
ApplicationMediator
718
ApplicationMediatorImpl
720
<<Interface>>
PlacementListener
724
PlacementEvent
722
<<Interface>>
ViewListener
719
ViewEvent
714
ValidationRule
710
ValidationRuleException
712
<<Interface>>
ViewController
702
Panel
(from awt)
707
JPanel
(from swing)
709
ViewControllerBaseImpl
706
ViewControllerImpl
704
ViewControllerAdapter
708
0..*
1

FIG. 7

ViewController

FIG. 8A

800

Variables

Name	Declaration	Description
copyright	public static final String _copyright	(c) International Business Machines, Inc., 1997 1998 1999. All rights reserved.

FIG. 8B

802

Methods

Name	Declaration	Description
addViewListener	public abstract void addViewListener (ViewListener listener)	Invoked when a ViewListener is added.
getComponent	public abstract Component getComponent()	Invoked when the ViewController as a component is needed.
getPermissions	public abstract String[] getPermissions ()	Invoked when the ViewController permission keys are needed.
isValid	public abstract boolean isValid()	Invoked when a ViewController's GUI state needs to be checked to see if it is valid.
isVisible	public abstract boolean isVisible()	Invoked to see if the ViewController is visible.
refresh	public abstract void refresh (Object data)	Invoked to supply new or changed data.
removeViewListener	public abstract void removeViewListener (ViewListener listener)	Invoked to remove a ViewListener.
setPermissions	public abstract void setPermissions (Hashtable permissions)	Invoked to set the permissions keys and values.
setProperties	public abstract void setProperties (Properties properties)	Invoked to set the properties.
setResources	public abstract void setResources (ResourceBundle bundle)	Invoked to set the resources.
setValidationLevel	public abstract void setValidationLevel (int level)	Invoked to give a hint to the ViewController as to what validation level to use. The value for level defined in this interface include: NONE=try to do no validation EVENT=try to do validation every event (key) FOCUS=try to do validation on focus change VIEWEVENT=try to do validation before a ViewEvent is issued.
setVisible	public abstract void setVisible (boolean visible)	Invoked to set the visibility.

ViewControllerImpl

900

Variables

Name	Declaration	Description
_copyright	public static final String _copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
validationLevel	protected int validationLevel	The current validation level.
viewEvent	protected ViewEvent viewEvent	A reference to a ViewEvent. Create one ViewEvent reuse it between events.
data	protected Object data	A reference to the data.

FIG. 9A

902

Constructors

Name	Declaration	Description
ViewControllerImpl	public ViewControllerImpl()	Default constructor.

FIG. 9B

ViewControllerImpl

904

Methods

Name	Declaration	Description
addViewListener	public final void addViewListener (ViewListener listener)	Add a ViewListener.
clear	public void clear()	Clear local state by setting the data reference to null and by removing all ViewListeners.
exit	public void exit()	Get read to exit. Clear local state by setting the data reference to null, removing all Viewlisteners and setting view listeners to null.
fireViewEvent	public final void fireViewEvent(ViewEvent event)	If the ViewEvent is not null then send it to all ViewListeners
getComponent	public Component getComponent()	Return the Component that is "this" ViewController. By default, "this" is returned. Redefine this method in ViewControllerBaseImpl when you have a non-java.awt.Component superclass.
getJTCs	public Vector getJTCs()	Return all JTC type objects defined. By default null is returned. Typically, ViewControllers will not return anything.
getPermissions	public String[] getPermissions()	Return a set "keys" that can a management system can use when assigning JTC function based on roles (i.e. group, user). For example, consider the common case of operator override. In grocery store, if a cashier makes a mistake, a manager inserts a key or enters a password to enable more function on the cash register. The software analogy is that a button may become active or disabled. Suppose the ViewController implements a button labeled "Override" and it is the only component whose state can be visibly altered outside the ViewController. The ViewController writer will return: "Override" In this case, the only options are ENABLE or DISABLE. Suppose these constants are define to be 0x001 and 0x002, respectively. A management system that maintains user privileges is queried at runtime. The ViewController is then called with setPermissions(keys, values) where keys is "Override" and values is "0x001". The ViewController writer now responds to this request by turning off the button. Instead of hard coding the possible roles, the ViewController simply reacts to key/value settings. By default, nothing is returned.

FIG. 9C

ViewControllerImpl (continued)

904

Methods

Name	Declaration	Description
init	public void init()	Initialize, by default do nothing.
isEnabled	public boolean isEnabled()	Is this ViewController enabled?
isValid	public boolean isValid()	Is the ViewController in a consistent state? This usually means: Do all fields pass ValidationRules? The meaning could also be application specific. This value can provide other components with the ability to show a visual indicator, such as an X or a check in a tree menu indicating incomplete or partial data. The default value is true.
isVisible	public boolean isVisible()	Is this ViewController visible?
refresh	public void refresh(Object data)	Data objects are being passed in. By default, keep a reference to them. Interpretation of the data is performed in the subclass. For example, suppose the data being passed is a Customer object. Then a subclass can perform the following: This can be extended to more complex data types and data type composites (i.e. arrays, Vectors, etc.).
removeViewListener	public final void removeViewListener (ViewListener listener)	Remove a ViewListener.
setEnabled	public void setEnabled(boolean toggle)	Enable or disable the ViewController. Remember the state and ask the ViewControllerBaseImpl to handle it.

FIG. 9D

ViewControllerImpl (continued)

FIG. 9E

904

Methods

Name	Declaration	Description

setPermissions	public void setPermissions (Hashtable permissions)	Given a set of keys and values, update the internal state of the ViewController. The keys and values are supplied via a management system and relate to roles (i.e. users and groups). The possible values in the key/value pairs are application and ViewController specific. For example, create an interface to define the keys and values:
		public interface Customer {
		public static final String DETAILS="DETAILS";
		public static final String ON="1";
		public static final String OFF="0";
		}
		then set the ViewController:
		Hashtable permissions=new Hashtable();
		permissions.put(Customer.DETAILS, Customer.ON);
		vc.setPermissions(Permissions);
		The ViewController will interpret the meaning of ON and perform the necessary action, such as active a button. The meaning of keys, values and actions should be defined in a GUI spec. By default, nothing happens.

setProperties	public void setProperties(Properties properties)	Set the properties. Default is to do nothing.
setResources	public void setResources(ResourceBundle bundle)	Set the ResourceBundles. Default is to do nothing.
setValidationLevel	public void setValidationLevel(int level)	Set the validation level to indicate when ValidationRules should be applied Four constants are defined in the ValidationRule class: NONE COMPONENT FOCUS VIEWEVENT This value will be stored for the subclass to reference and act. The default value is ValidationRule.NONE.
setVisible	public void setVisible(boolean visible)	Set the ViewController's visibility on or off. Remember the state and ask the ViewControllerBaseImpl to handle it.
toString	public String toString()	Return the instance class name.

ViewControllerBaseImpl

1000

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 10A

1002

Constructors

Name	Declaration	Description
ViewControllerBaseImpl	public ViewControllerBaseImpl()	Default constructor.

FIG. 10B

Methods

Name	Declaration	Description
getComponent	public Component getComponent()	By default, return this. This works when the superclass is derived from java.awt.Component. Otherwise, override this method and return your own this, but be sure to override setEnabled and setVisible also.
setEnabled	public void setEnabled(boolean toggle)	By default, passes the call to the super class.
setVisible	public void setVisible(boolean visible)	By default, passes the call to the super class.

FIG. 10C

ViewControllerAdapter

1100

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 11A

1102

Constructors

Name	Declaration	Description
ViewControllerAdapter	public ViewControllerAdapter()	Constructor.

FIG. 11B

1104

Methods

Name	Declaration	Description
actionPerformed	public void actionPerformed(ActionEvent e)	Do nothing.
adjustmentValueChanged	public void adjustmentValueChanged(AdjustmentEvent e)	Do nothing.
componentAdded	public void componentAdded(ContainerEvent e)	Do nothing.
componentHidden	public void componentHidden(ComponentEvent e)	Do nothing.
componentMoved	public void componentMoved(ComponentEvent e)	Do nothing.
componentRemoved	public void componentRemoved(ContainerEvent e)	Do nothing.
componentResized	public void componentResized(ComponentEvent e)	Do nothing.
componentShown	public void componentShown(ComponentEvent e)	Do nothing.
focusGained	public void focusGained(FocusEvent e)	Do nothing.
focusLost	public void focusLost(FocusEvent e)	Do nothing.
itemStateChanged	public void itemStateChanged(ItemEvent e)	Do nothing.
keyPressed	public void keyPressed(KeyEvent e)	Do nothing.
keyReleased	public void keyReleased(KeyEvent e)	Do nothing.
keyTyped	public void keyTyped(KeyEvent e)	Do nothing.
mouseClicked	public void mouseClicked(MouseEvent e)	Do nothing.
mouseDragged	public void mouseDragged(MouseEvent e)	Do nothing.
mouseEntered	public void mouseEntered(MouseEvent e)	Do nothing.
mouseExited	public void mouseExited(MouseEvent e)	Do nothing.
mouseMoved	public void mouseMoved(MouseEvent e)	Do nothing.
mousePressed	public void mousePressed(MouseEvent e)	Do nothing.
mouseReleased	public void mouseReleased(MouseEvent e)	Do nothing.
textValueChanged	public void textValueChanged(TextEvent e)	Do nothing.

FIG. 11C

ValidationRule

FIG. 12A

1200

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
NONE	public static final int NONE	
COMPONENT	public static final int COMPONENT	
FOCUS	public static final int FOCUS	
VIEWEVENT	public static final int VIEWEVENT	

FIG. 12B

1202

Constructors

Name	Declaration	Description
ValidationRule	public ValidationRule()	

FIG. 12D

1206

```
/**
* Given a list of class names, apply each validation rule of the classes
* to input string and return the formatted result.
*
* @return the viewable formatted string.
* @param classNames a comma-separated fully qualified list of concrete AbstractRule classes.
* @param input the input string to apply edit rules to.
* @exception ValidatonRuleException if there was an error in applying the edits.
*/
public static String applyEdits(String classNames, String input) throws ValidationRuleException {
      int commaIndex = -1;
      int curIndex = 0;
      do {
            commaIndex=classNames.indexOf(',', curIndex);
            if (commaIndex == -1) {
                  commaIndex = classNames.length();
            }
            String className = classNames.substring(curIndex, commaIndex).trim();
            try {
                  ValidationRule rule = (ValidationRule) Factory.newInstance(className);
                  input = rule.edit(input);
            } catch (ValidationRuleException re) {
                  throw re;
            }  catch (Exception e) {
                  throw new ValidationRuleException("Rule class '" + className + "' not found.");
            }
            curIndex = commaIndex + 1;
      } while (curIndex < classNames.length());
      return input;
}
```

1204

Methods

Name	Declaration	Description
applyEdits	public static String applyEdits (String classNames, String input) throws ValidationRuleException	Given a list of class names, apply each validation rule of the classes to input string and return the formatted result. Parameters: classNames – a comma-separated fully qualified list of concrete AbstractRule classes. input – the input string to apply edit rules to. Returns: the viewable formatted string. Throws: ValidationRuleException if there was an error in applying the edits.
applyNormalize	public static String applyNormalize (String classNames, String input) throws ValidationRuleException	Given a list of class names, apply each normalize rule of the classes to input string and return the transmittable result. Parameters: classNames – a comma-separated fully qualified list of concrete AbstractRule classes. input – the input string to apply normalize rules to. Returns: the transmittable string. Throws: ValidationRuleException
edit	public abstract String edit (String input) throws ValidationRuleException	Subclasses must implement this method to take an input string and apply some edit rule which returns a properly formatted string that can be used to display to the user. Parameters: input–the input string. Returns: the viewable formatted string. Throws: ValidationRuleException if unable to properly format input string.
normalize	public abstract String normalize (String input) throws ValidationRuleException	Subclasses must implement this method to take an input string and apply some normalize rule which returns a properly formatted string that can be used to send data to some server. Parameters: input – the input string. Returns: the transmittable string. Throws: ValidationRuleException if unable to properly format input string.

FIG. 12C

ValidationRuleException

1300

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 13A

1302

Constructors

Name	Declaration	Description
ValidationRuleException	public ValidationRuleException()	Default constructor.
ValidationRuleException	public ValidationRuleException(String s)	Constructor with a message to the rule exception.

FIG. 13B

ViewEvent

FIG. 14A

1400

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
VIEWEVENT_FIRST	public static final int VIEWEVENT_FIRST	
OK	public static final int OK	
DONE	public static final int DONE	
OPEN	public static final int OPEN	
CLOSE	public static final int CLOSE	
CANCEL	public static final int CANCEL	
EXIT	public static final int EXIT	
FILE	public static final int FILE	
SAVE	public static final int SAVE	
SAVEAS	public static final int SAVEAS	
ERROR	public static final int ERROR	
WARNING	public static final int WARNING	
RETURN	public static final int RETURN	
LOAD	public static final int LOAD	
NOTIFY	public static final int NOTIFY	
NOTIFY2	public static final int NOTIFY2	
INFO	public static final int INFO	
SETUP	public static final int SETUP	
PRINT	public static final int PRINT	

ViewEvent
(continued)

1400

Variables

Name	Declaration	Description
TITLEMESSAGE	public static final int TITLEMESSAGE	
STATUSMESSAGE	public static final int STATUSMESSAGE	
ERRORMESSAGE	public static final int ERRORMESSAGE	
SUGGESTIONMESSAGE	public static final int SUGGESTIONMESSAGE	
NEXT	public static final int NEXT	
PREVIOUS	public static final int PREVIOUS	
FIRST	public static final int FIRST	
LAST	public static final int LAST	
START	public static final int START	
BEGIN	public static final int BEGIN	
END	public static final int END	
PAUSE	public static final int PAUSE	
STOP	public static final int STOP	
RESTART	public static final int RESTART	
SUBMIT	public static final int SUBMIT	
BACKSPACE	public static final int BACKSPACE	
INSERT	public static final int INSERT	

FIG. 14B

ViewEvent (continued)

FIG. 14C

1400

Variables

Name	Declaration	Description
HOME	public static final int HOME	
PGUP	public static final int PGUP	
PGDN	public static final int PGDN	
LEFT	public static final int LEFT	
RIGHT	public static final int RIGHT	
UP	public static final int UP	
DOWN	public static final int DOWN	
LIST	public static final int LIST	
MORE	public static final int MORE	
ADD	public static final int ADD	
DELETE	public static final int DELETE	
MODIFY	public static final int MODIFY	
NEW	public static final int NEW	
EDIT	public static final int EDIT	
COPY	public static final int COPY	
CUT	public static final int CUT	
PASTE	public static final int PASTE	
UNDO	public static final int UNDO	
REMOVE	public static final int REMOVE	
PLUS	public static final int PLUS	
MINUS	public static final int MINUS	
INCREMENT	public static final int INCREMENT	
DECREMENT	public static final int DECREMENT	
CHANGED	public static final int CHANGED	

ViewEvent (continued)

FIG. 14D

1400

Variables

Name	Declaration	Description
FILL	public static final int FILL	
EMPTY	public static final int EMPTY	
READY	public static final int READY	
VIEW	public static final int VIEW	
DETAILS	public static final int DETAILS	
READ	public static final int READ	
WRITE	public static final int WRITE	
SEARCH	public static final int SEARCH	
FIND	public static final int FIND	
HELP	public static final int HELP	
HINT	public static final int HINT	
TRAIN	public static final int TRAIN	
TEACH	public static final int TEACH	
SUGGEST	public static final int SUGGEST	
VIEWEVENTTEST1	public static final int VIEWEVENTTEST1	
VIEWEVENTTEST2	public static final int VIEWEVENTTEST2	
VIEWEVENTTEST3	public static final int VIEWEVENTTEST3	
VIEWEVENT_LAST	public static final int VIEWEVENT_LAST	
consumed	protected boolean consumed	Is event still valid?
timestamp	protected long timestamp	Time stamp when event is fired.
data	protected Object data	Data reference.

FIG. 14E

1402

Constructors

Name	Declaration	Description
ViewEvent	public ViewEvent()	Constructs a ViewEvent.
ViewEvent	public ViewEvent(Object source)	Constructs a ViewEvent.
ViewEvent	public ViewEvent(Object source, int major)	Constructs a ViewEvent object with the specified source object and code;
ViewEvent	public ViewEvent(Object source, int major, int mirror, Object data)	Constructs a ViewEvent object with the specified source object and code;
ViewEvent	public ViewEvent(Object source, int major, Object data)	Constructs a ViewEvent object with the specified source object and code;

ViewEvent (continued)

FIG. 14F

1404

Methods

Name	Declaration	Description
consume	public final void consume()	Consume this event.
getData	public Object getData()	Return the data.
getMajor	public final int getMajor()	Return the major event code.
getMinor	public final int getMinor()	Return the event option.
getSource	public final Object getSource()	Gets the event source Overrides: getSource in class EventObject.
getTimestamp	public long getTimestamp()	Get the timestamp when the event was fired. By default, this was set by JTC.
isConsumed	public final boolean isConsumed()	Is the event consumed?
setConsumed	public final void setConsumed(boolean consumed)	Turn event consumed on/off.
setData	public void setData(Object data)	Sets the data.
setMajor	public final void setMajor(int code)	Sets the event code.
setMinor	public final void setMinor(int code)	Sets the event option.
setSource	public final void setSource(Object source)	Sets the event source.
setTimestamp	public void setTimestamp(long time)	Set the timestamp when the event is fired. By default, this is set by JTC.
toString	public String toString()	Returns a string representation of the object. The class of the event and the reason for the event is returned.

ViewListener

1500

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 15A

1502

Methods

Name	Declaration	Description
viewEventPerformed	public abstract void viewEventPerformed(ViewEvent event)	Invoked when a ViewEvent has been fired.

FIG. 15B

ApplicationMediator

1600

Variables

Name	Declaration	Description
copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 16A

FIG. 16B

1602

Methods

Name	Declaration	Description
addPlacementListener	public abstract void addPlacementListener (PlacementListener listener)	Invoked when a PlacementListener is added.
addRequestListener	public abstract void addRequestListener (RequestListener listener)	
addTopListener	public final void addTopListener (TopListener listener)	Add a TopListener.
addViewListener	public abstract void addViewListener (ViewListener listener)	Invoked when a ViewListener is added.
getPermissions	public abstract String[] getPermissions()	Invoked when the ApplicationMediator permission keys are needed.
init	public abstract void init (ApplicationMediator applicationMediator)	Invoked when an ApplicationMediator should be initialized based on another ApplicationMediator's contents.
isValid	public abstract boolean isValid()	Invoked when the ApplicationMediator's state needs to be checked to see if it is valid.
isVisible	public abstract boolean isVisible()	Invoked to see if the ApplicationMediator is visible.
refresh	public abstract void refresh (Object data)	Invoked to supply new or changed data.
removePlacementListener	public abstract void removePlacementListener (PlacementListener listener)	Invoked to remove a PlacementListener.
removeRequestListener	public abstract void removeRequestListener (RequestListener listener)	Invoked to remove a RequestListener.
removeTopListener	public final void removeTopListener (TopListener listener)	Removes the TopListener.
removeViewListener	public abstract void removeViewListener (ViewListener listener)	Invoked to remove a ViewListener.
setPermissions	public abstract void setPermissions (Hashtable permissions)	Invoked to set the permissions keys and values.
setProperties	public abstract void setProperties (Properties properties)	Invoked to set the properties.
setResouces	public abstract void setResources (ResourceBundle bundle)	Invoked to set the resources.
setVisible	public abstract void setVisible(boolean visible)	Invoked to set the visibility.

ApplicationMediatorImpl

1700

Variables

Name	Declaration	Description
placementListeners	protected Vector placementListeners	The PlacementListeners.
topListeners	protected TopListener topListener	The TopListener.
requestListeners	protected Vector requestListeners	The RequestListeners.
viewListeners	protected Vector viewListeners	The ViewEventListeners.
viewControllers	protected Vector viewControllers	Whenever view controllers are created, it is by convention they will be added to this array.
applicationMediators	protected Vector applicationMediators	Whenever application mediators are created, it is by convention they will be added to this array.
data	protected Object data	This is a reference to the system data model.
requestEvent	protected RequestEvent requestEvent	This is a reference to a RequestEvent.

FIG. 17A

1702

Constructors

Name	Declaration	Description
ApplicationMediatorImpl	public ApplicationMediatorImpl()	Constructor. By changing commented code, you can switch between threading styles 1 and 2.

FIG. 17B

ApplicationMediatorImpl

FIG. 17C

1704

Methods

Name	Declaration	Description
addPlacementListener	public final void addPlacementListener(PlacementListener listener)	Add a PlacementListener.
addRequestListener	public final void addRequestListener(RequestListener listener)	Add a RequestListener.
addTopListener	public final void addTopListener(TopListener listener)	Add a TopListener.
addViewListener	public final void addViewListener(ViewListener listener)	Add a ViewListener.
clear	public void clear()	Clear the ApplicationMediator by clearing all allocated ViewControllers and ApplicationMediators. All data is set to null, but lists are not destroyed. A 'cleared' ApplicationMediator can be used again. If this method is overriden in a subclass, be sure to invoke super.clear();
exit	public void exit()	Exit the ApplicationMediator by exiting all allocated ViewControllers and ApplicationMediators. All data is set to null, and lists are destroyed. An 'exited' ApplicationMediator cannot be used again. If this method is overriden in a subclass, be sure to invoke super.exit();
firePlacementEvent	protected final void firePlacementEvent(PlacementEvent event)	Notify the PlacementListeners.
fireRequestEvent	protected final void fireRequestEvent(RequestEvent event) throws RequestException	Notify the RequestListeners - synchronous.
fireRequestEvent	protected final void fireRequestEvent(RequestEvent event, RequestResponseListener caller) throws RequestException	Notify the RequestListeners - asynchronous.
fireTopEvent	protected final void fireTopEvent(TopEvent event)	Notify the TopListeners.
fireTopListener		
fireViewEvent	protected final void fireViewEvent(ViewEvent event)	Notify the ViewListeners.
getAM	protected ApplicationMediator getAM(int i)	Return the i'th ApplicationMediator.
getJTCs	public Vector getJTCs()	Return a vector of all ThinClient objects. By default, this is a Vector containing the created ViewControllers and ApplicationMediators.

ApplicationMediatorImpl (continued) *FIG. 17D* 1704

Methods

Name	Declaration	Description
getPermissions	public String[] getPermissions()	Get the settable permission keys. By default, return the class names of all allocated ViewControllers and ApplicationMediators.
getVC	protected ViewController getVC(int i)	Return the i'th ViewController
init	public void init()	Initialize the ApplicationMediator, nothing to do by default.
init	public void init(ApplicationMediator applicationMediator)	Initialize the ApplicationMediator using the listeners of an existing ApplicationMediator.
initApplicationMediators	public final void initApplicationMediators(String classnames[]) throws ClassNotFoundException, InstantiationException, IllegalAccessException	For each ApplicationMediator classname, load it, new it and add myself as a ViewEvent. The Factory class is used as helper class.
initViewControllers	public final void initViewControllers(String classnames[]) throws ClassNotFoundException, InstantiationException, IllegalAccessException	For each ViewController classname, load it, new it and add myself as a ViewEvent. The Factory class is used as helper class.
isEnabled	public boolean isEnabled()	Is the ApplicationController enabled?
isValid	public boolean isValid()	Return the AND'ed value of calling isValid on ApplicationMediators and ViewControllers.
isVisible	public boolean isVisible()	Is the ApplicationController visible? Hardly, since it is a non visible class. But this looks to see if any of its ViewControllers are visible. Not really, they were all set to visible/invisible via the setVisible method and we remembered the state to return here.
processViewEvent	public abstract void processViewEvent(ViewEvent e)	Deliver the ViewEvent to the subclass via this method.
refresh	public void refresh(Oject data)	When new data arrives allow the ViewControllers and ApplicationControllers to be refreshed also.
removePlacementListener	public final void removePlacementListener(PlacementListener listener)	Removes the PlacementListener.

FIG. 17E

1704

Methods

Name	Declaration	Description
removeRequestListener	public final void removeRequestListener(RequestListener listener)	Removes the RequestListener.
removeViewListener	public final void removeViewListener(ViewListener listener)	Removes the ViewListener.
requestException	public void requestException(RequestException yikes)	Called back because an asynchronous request has thrown an Exception. By default, print the message to System.err.
requestResponse	public void requestResponse(RequestEvent response)	Called back with the results of an asynchronous request. By default, call refresh with the data in the response.
run2	public final void run2()	This method is used in style 1 threading. Rename this to run() and uncomment the code as described in the class javadoc.
setAM	public void setAM(ApplicationMediator applicationMediator, int i)	Set the i'th ApplicationMediator.
setEnabled	public void setEnabled(boolean toggle)	Call setEnabled on each ViewController and ApplicationMediator.
setPermissions	public void setPermissions(Hashtable permissions)	Set the permissions. By default, call setPermissions on each ViewController and ApplicationMediator.
setProperties	public void setProperties(Properties properties)	Set the properties. By default, call setProperties on each ViewController and ApplicationMediator.
setResources	public void setResources(ResourceBundle bundle)	Set the resources. By default, call setResources on each ViewController and ApplicationMediator.
setVC	public void setVC(ViewController viewController, int i)	Set the i'th ViewController.
setVisible	public void setVisible(boolean visible)	Set visible on each ViewController and ApplicationMediator.
toString	public String toString()	Return the Class name of the ApplicationController instance.
viewEventPerformed	public void viewEventPerformed(ViewEvent e)	A ViewEvent is delivered. Process it using Threading style 1 or 2. In the end, the processViewEvent will be called on the subclass.

1706

ApplicationMediator Impl.exit(): AUS8-1999-0694

```
/**
 * Exit the ApplicationMediator by exiting all allocated ViewControllers
 * and ApplicationMediators. All data is set to null, and lists are
 * destroyed. An 'exited' ApplicationMediator cannot be used again.
 * If this method is overriden in a subclass, be sure to invoke
 * super.exit();
 **/
public void exit() {
     synchronized (this) {

          /* Used for style 1 event dispatching. Leave this code commented. */
          //if (this.eventThread !=null) {
          //    try {
          //         eventThread.stop ();
          //    } catch (Exception e) {
          //    }
          //}

          /* Used for style 2 event dispatching. Leave this code commented. */
          for (int i = 0; i < runningThreads.size(); i++) {
               ((ApplicationMediatorThread) runningThreads.elementAt (i)) .stop();
          }
          runningThreads.removeAllElements();
          viewListeners.removeAllElements();
          try {
               for (int i = 0; i < viewControllers.size(); i++) {
                    ((ViewController) viewControllers.elementAt(i)) .setEnabled(false);
                    ((ViewController) viewControllers.elementAt(i)) .exit ();
               }
               for (int i = 0; i < applicationMediators.size(); i++) {
                    ((ApplicationMediator) applicationMediators.elementAt(i)) .setEnabled(false);
                    ((ApplicationMediator) applicationMediators.elementAt(i)) .exit();
               }
          } catch (Exception noProblem) {
          }
          viewControllers = null;
          applicationMediators = null;
          runningThreads = null;
          runningThreads = null;
          data = null;
     }
}
```

FIG. 17F

1708

ApplicationMediatorImpl.clear(): AUS8-1999-0694

```
/**
 * Clear the ApplicationMediator by clearing all allocated ViewControllers
 * and ApplicationMediators. All data is set to null, but lists are
 * not destroyed. A 'cleared' ApplicationMediator can be used again.
 * If this methed is overriden in a subclass, be sure to invoke
 * super.clear();
 */
public void clear() {
     synchronized (this) {

          /* Used for style 1 event dispatching. Leave this code commented. */
          //if (this.eventThread != null) {
          //    try {
          //         eventThread.stop ();
          //    } catch (Exception e) {
          //    }
          //}

          /* Used for style 2 event dispatching. Leave this code commented. */
          for (int i = 0; i < runningThreads.size(); i++) {
               ((ApplicationMediatorThread) runningThreads.elementAt (i)) .stop();
          }
          runningThreads.removeAllElements();

          //
          try {
               for (int i = 0; i < viewControllers.size(); i++) {
                    ((ViewController) viewControllers.elementAt(i)) .setEnabled(false);
                    ((ViewController) viewControllers.elementAt(i)) .clear ();
               }
               for (int i = 0; i < applicationMediators.size(); i++) {
                    ((ApplicationMediator) applicationMediators.elementAt(i)) .setEnabled(false);
                    ((ApplicationMediator) applicationMediators.elementAt(i)) .clear();
               }
          } catch (Exception noRealProblem) {
          }
          viewControllers = null;
          applicationMediators = null;
          data = null;
          viewListeners.removeAllElements();
     }
}
```

FIG. 17G

1710

```
/**
 * Initalize the ApplicationMediator using the listeners of an
 * existing ApplicationMediator.
 */
public void init(ApplicationMediator applicationMediator) {
      if (applicationMediator instanceof ApplicationMediatorImpl) {
            ApplicationMediatorImpl a = (ApplicationMediatorImpl) applicationMediator;
            requestListeners = (Vector) a.requestListeners.clone();
            placementListeners = (Vector) a.placementListeners.clone();
            topListeners = (Vector) a.topListeners.clone();
            addViewListener(a);
      }
      init();
}
```

FIG. 17H

1712

```
/**
 * When new data arrives allow the ViewControllers
 * and ApplicationControllers to be refreshed also.
 */
public void refresh(Object data) {
      this.data = data;
      try {
            synchronized (viewControllers) {
                  for (int j = 0; j < viewControllers.size(); j++) {
                        ((ViewController) viewControllers.elementAt(j)).
                              refresh(data);
                  }
            }
      } catch (Exception noRealProblem) {
      }
      try {
            synchronized (applicationMediators) {
                  for (int j = 0; j < applicationMediators.size(); j++) {
                        ((ApplicationMediator) applicationMediators.
                              elementAt(j)).refresh(data);
                  }
            }
      } catch (Exception noRealProblem) {
      }
}
```

FIG. 17I

1714

```
/**
 * A ViewEvent is delivered. Process it using Threading style 1 or 2. In
 * the end, the processViewEvent will be called on the subclass.
 */
public void viewEventPerformed (ViewEvent e) {
      /* Used for style 2 event dispatching, start an inner class thread */
      ApplicationMediatorThread t = new ApplicationMediatorThread (e);
      runningThreads.addElement (t);
      t.start ();

      /* Used for style 1 event dispatching. Leave this code commented. */
      //ViewEvent saved = saveViewEvent(e);
      //if (eventThread == null || !eventThread.isAlive()) {
      // finished = false;
      // eventThread = new Thread(this);
      // eventThread.start ();
      //}
      //synchronized (this) {
      // notify();
      //}
}
```

FIG. 17J

1714

```
/**
 * This method is used in style 1 threading. Rename this to run ()
 * and uncomment the code as described in the class javadoc.
 */
public final void run2 () {
    /* Used for style 1 event dispatching. Leave this code commented. */
    /*
    while (true) {
            ViewEvent event = null;
        event = getViewEvent ();
        if (event != null) {
            handleViewEvent (event);
        } else {
            waitForEvent ();
            if (finished) {
            // something went wrong with the thread so hose this loop
            break;
            }
        }
    }
    */
}
```

FIG. 17K

1714

```
/**
* Private class to handle executions of ViewEvents () on another thread.
**/
private class ApplicationMediatorThread extends Thread {
    /**
    * The current event
    **/
    private ViewEvent event;
    /**
    * Create an ApplicationMediatorThread to process the ViewEvent
    **/
    public ApplicationMediatorThread(ViewEvent event) {
        super ();
        this.event = event;
    }
    /**
    * Just call the handleViewEvent method that the subclass will override
    **/
    public void run () {
        processViewEvent (event);
    }
}
```

FIG. 17L

1714

```
/**
 * Save the current ViewEvent on a Q
 */
private final ViewEvent saveViewEvent (ViewEvent e) {
    /* Used for style 1 event dispatching. Leave this code commented. */
    //return viewEventQueue.add(e);
    return null;
}

/**
 * Method: return the first view event saved. Used by the Q'ing system.
 */
private ViewEvent getViewEvent () {
    /* Used for style 1 event dispatching. Leave this code commented. */
    //return (ViewEvent) viewEventQueue.remove();
    return null;
}
```

FIG. 17M

PlacementEvent

FIG. 18A

1800

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
PLACEMENTEVENT_FIRST	public static final int PLACEMENTEVENT_FIRST	
ADD	public static final int ADD	
REMOVE	public static final int REMOVE	
MODIFY	public static final int MODIFY	
PLACEMENTEVENT_LAST	public static final int PLACEMENTEVENT_LAST	
major	protected int major	The placementevent code
minor	protected int minor	The placementevent option
component	protected Object component	Component Reference
data	protected Object data	Data reference

FIG. 18B

1802

Constructors

Name	Declaration	Description
PlacementEvent	public PlacementEvent()	Constructs a PlacementEvent
PlacementEvent	public PlacementEvent(Object source, Object component)	Constructs a PlacementEvent
PlacementEvent	public PlacementEvent(Object source, Object component, int major)	Constructs a PlacementEvent
PlacementEvent	public PlacementEvent(Object source, Object component, int major, int minor)	Constructs a PlacementEvent
PlacementEvent	public PlacementEvent(Object source, Object component, int major, int minor, Object data)	Constructs a PlacementEvent

FIG. 18C

1804

Methods

Name	Declaration	Description
getComponent	public final Component getComponent()	Return the Component
getData	public final Object getData()	Return the data
getMajor	public final int getMajor()	Return the major code
getMinor	public final int getMinor()	Return the minor code
getSource	public final Object getSource()	Gets the event source
setComponent	public final void setComponent(Component component)	Sets the Component
setData	public final void setData(Object data)	Set the data
setMajor	public final void setMajor(int code)	Set the major code
setMinor	public final void setMinor(int code)	Sets the minor code
setSource	public final void setSource(Object source)	Set the event source
toString	public String toString()	Returns a string representation of the object.

PlacementListener

FIG. 19A

1900

Variables

Name	Declaration	Description
copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 19B

1902

Methods

Name	Declaration	Description
placementEventPerformed	public abstract void placementEventPerformed (PlacementEvent event)	Invoked when we are being called to add/remove/modify a component. Do it.

TopEvent

FIG. 20A

2000

Variables

Name	Declaration	Description
copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
TOPEVENT_FIRST	public static final int TOPEVENT_FIRST	
EXIT	public static final int EXIT	
BROWSER	public static final int BROWSER	
TITLE	public static final int TITLE	
STATUS	public static final int STATUS	
OS	public static final int OS	
A	public static final int A	
B	public static final int B	
C	public static final int C	
D	public static final int D	
E	public static final int E	
F	public static final int F	
TRACE	public static final int TRACE	
DEBUG	public static final int DEBUG	
LOG	public static final int LOG	
HOOKAWT	public static final int HOOKAWT	
HOOKJTC	public static final int HOOKJTC	
TOPEVENT_LAST	public static final int TOPEVENT_LAST	
TEAM	public static final int TEAM	
WIN	public static final int WIN	
EXECUTE	public static final int execute	
consumed	protected boolean consumed	Is event still valid?
data	protected Object data	This is a loose reference to the data model. We don't care what the class shape is and we only reference it via the interface that it must implement.

TopEvent

FIG. 20B

2002

Constructors

Name	Declaration	Description
TopEvent()	public TopEvent ()	Default constructor for a Request.
TopEvent(Object)	public TopEvent (Object source)	Construct with the given source and default major and minor values.
TopEvent(Object, int)	public TopEvent (Object source, int major)	Create a Request with a source, major and minor codes.
TopEvent(Object, int, int)	public TopEvent (Object source, int major, int minor)	Create a Request with major and minor codes.
TopEvent(Object, int, int, Object)	public TopEvent (Object source, int major, int minor, Object data)	Create a Request with a source, major and minor codes, and some data. If source is null, an InvalidArgumentException will be thrown.

FIG. 20C

2004

Methods

Name	Declaration	Description
consume	public final void consume ()	Consume this event.
getData	public final Object getData ()	Return the reference to the data.
getMajor	public final int getMajor ()	Get the major code.
getMinor	public final int getMinor ()	Get the minor code.
getSource	public final Object getSource ()	Gets the event source. Overrides: getSource in class EventObject.
isConsumed	public final boolean isConsumed ()	Is the event consumed?
setConsumed	public final void setConsumed (boolean consumed)	Turn event consumed on or off.
setData	public final void setData (Object data)	Set the data.
setMajor	public final void setMajor (int major)	Set the major code.
setMinor	public final void setMinor (int minor)	Set the minor code. This is always a String.
setSource	public final void setSource (Object source)	Sets the event source.
toString	public String toString ()	Show a String representation of the Request in the format of "TopEvent(major,minor)".

TopListener

2100

Variables

Name	Declaration	Description
copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 21A

2102

Methods

Name	Declaration	Description
exec	public abstract void exec (Object programInformation)	Invoked to execute a desktop program. The parameter programInformation can be a complex object with lots of data. For example: String[] params = {"netscape.exe", "http://www.ibm.com"}; aTopListener.exec(params). Another usage might be to interact with JavaScript under a browser. It is up to the TopListener implementer to understand what the params mean. Do not create a language with a language. This method should only be defined to support legacy environments or corporate desktop rules. Consider using a RequestEvent for more complex requirements.
exit	public abstract void exit()	Invoked to exit a JTC application. Never let a program perform its own "exit". This shuts the JVM down. The implementer of TopListener will know the appropriate actions to take to exit from an application on a corporate desktop.
message	public abstract void message (Object messageInfo)	Invoked to show a business specific message. Try to isolate calls to the browser here.
title	public abstract void title (Object titleInfo)	Invoked to display a business specific title. Try to isolate calls to a browser or a desktop program to display titles here.
topEventPerformed	public abstract void topEventPerformed (TopEvent event)	Invoked when we are being called to perform a top desktop function.

FIG. 21B

RequestEvent

2200

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
consumed	protected boolean consumed	Is event still valid?
data	protected Object data	This is a loose reference to the data model. We don't care what the class shape is and we only reference it via the interface that it must implement.

FIG. 22A

2202

Constructors

Name	Declaration	Description
RequestEvent	public RequestEvent()	Default constructor for a Request.
RequestEvent	public RequestEvent(Object source)	Construct with the given source and default major and minor values.
RequestEvent	public RequestEvent(Object source, String major)	Create a Request with a source, major and minor codes.
RequestEvent	public RequestEvent(Object source, String major, String minor)	Create a Request with major and minor codes.
RequestEvent	public RequestEvent(Object source, String majorCode, String minorCode, Object data)	Create a Request with a source, major and minor codes, and some data. If source is null, an InvalidArgumentException will be thrown.

FIG. 22B

2204

Methods

Name	Declaration	Description
consume	public final void consume()	Consume this event.
getData	public final Object getData()	Return the reference to the data.
getMajor	public final String getMajor()	Get the major code. This is always a String.
getMinor	public final String getMinor()	Get the minor code. This is always a String.
getSource	public final Object getSource()	Gets the event source.
getStatus	public final String getStatus()	Return the status.
isConsumed	public final boolean isConsumed()	Is the event consumed?
setConsumed	public final void setConsumed(boolean consumed)	Turn event consumed on or off.
setData	public final void setData(Object data)	Set the data.
setMajor	public final void setMajor(String major)	Set the major code. This is always a String.
setMinor	public final void setMinor(String minor)	Set the minor code. This is always a String.
setSource	public final void setSource(Object source)	Sets the event source.
setStatus	public final void setStatus(String message)	Append a message to the status.
toString	public String toString()	Show a String representation of the Request in the format of "RequestEvent(major,minor)".

FIG. 22C

RequestException

2300

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 23A

2302

Constructors

Name	Declaration	Description
RequestException	public RequestException()	Default constructor.
RequestException	public RequestException(String s)	Constructor with a message to the request exception.
RequestException	public RequestException(Throwable target)	Constructor with a throwable target.
RequestException	public RequestException(Throwable target, String s)	Constructor with a throwable target and a message.

FIG. 23B

2304

Methods

Name	Declaration	Description
getTargetException	public Throwable getTargetException()	Get the target throwable.
setTargetException	public void setTargetException(Throwable target)	Set the target throwable.
toString	public String toString()	String version.

FIG. 23C

RequestListener

FIG. 24A

2400

Variables

Name	Declaration	Description
copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 24B

2402

Methods

Name	Declaration	Description
requestEventPerformed	public abstract void requestEventPerformed (RequestEvent request) throws RequestException	Invoked for a synchronous RequestEvent.
requestEventPerformed	public abstract void requestEventPerformed (RequestEvent request, RequestResponseListener listener) throws RequestException	Invoked for an asynchronous RequestEvent.

RequestResponseListener

FIG. 25A

2500

Variables

Name	Declaration	Description
copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 25B

2502

Methods

Name	Declaration	Description
requestException	public abstract void requestException (RequestException yikes)	Invoked when an exception occured during processing of an asynchronous RequestEvent.
requestResponse	public abstract void requestResponse (RequestEvent result)	Invoked when the processing of an asynchronous RequestEvent was successful.

Transporter

2600

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
PRIORITY	public static final String PRIORITY	Priority symbol.
WILDCARD	public static final String WILDCARD	Wildcard symbol.

FIG. 26A

2602

Constructors

Name	Declaration	Description
Transporter	public Transporter()	Default constructor.

FIG. 26B

Transporter

FIG. 26C

2604

Methods

Name	Declaration	Description
addDestinationListener	public void addDestinationListener (Object major, Destination destination)	Add the Destination using the given major code. If the destination is present with the same major don't re-add it - only one major/destination pair can exist. If the major is present, but the destination isn't, add the destination to the list of other destinations with the same key. If the key isn't present, store it and then add the new destination. If the destination is disabled, do nothing.
clear	public void clear()	For each RequestEvent not started, a RequestException will be thrown and the internal data structures will be emptied including RequestEvent queues and listeners.
exit	public void exit()	For each RequestEvent not started, a RequestException will be thrown and the internal data structures will be emptied including RequestEvent queues and listeners. All variable references will be set to null.
getDestinations	public synchronized Vector getDestinations()	Return a Vector of all Destinations currently registered.
getDestinations	public Vector getDestinations(Object major)	Return a Vector of the Destinations currently registered for the given major code.
getJTCs	public Vector getJTCs()	Return allocated JTC objects. By default, return the Destinations.
getMajorCodes	public Vector getMajorCodes()	Return a Vector of the registered major codes.
init	public void init()	Initialize the transporter. By default, do nothing.
isEnabled	public boolean isEnabled()	Is this Transporter enabled or disabled? A Transporter that is disabled will not process a RequestEvents but will throw RequestExceptions.

Transporter (continued)

FIG. 26D

2604

Methods

Name	Declaration	Description
isTagging	public boolean isTagging()	Is this Transporter tagging RequestEvents?
processDestinations	protected void processDestinations(RequestEvent request, Vector currentDestinations) throws RequestException	Given a RequestEvent and a Vector of destinations, call each Destination in FIFO/FEFR order. If tagging is enabled, then append a status tag to the RequestEvent.
removeDestinationListener	public void removeDestinationListener (Object major, Destination d)	Remove the destination using the given major. If the destination is not present, do nothing. If the destination is present, just remove it. If it was the last destination, remove all references to the major code.
requestEventPerformed	public void requestEventPerformed(RequestEvent request) throws RequestException	Submit a synchronous request. For each Destination that is listening for the current family of RequestEvents (the major code), send the RequestEvent to the Destination for processing. If there is a problem, throw a RequestException. Continue processing the RequestEvent as long as a RequestException is not thrown by a Destination and the RequestEvent is not consumed. If tagging is enabled, then append a status tag to the RequestEvent. Destinations are processed in the following FIFO order: 1-All using "!" (priority). 2-All using a major code. 3-All using "*".
requestEventPerformed	public void requestEventPerformed(RequestEvent request, RequestResponseListener caller) throws RequestException	Submit an asynchronous request. See the synchronous requestEventPerformed for more information.
setEnabled	public void setEnabled(boolean toggle)	Enable or disable the Transporter. A disabled Transporter will throw RequestExceptions if accessed via requestEventPerformed.
setRequestTagging	public void setRequestTagging(boolean toggle)	Stop or start the tagging of Requests.
toString	public String toString()	Return the String Transporter plus the number of registered Destinations.

2604

Transporter.processDestinations(RequestEvent, Vector):AUS8-1999-0693

```
/**
 * Given a RequestEvent and a Vector of destinations, call each Destination
 * in FIFO/FEFR order.
 * <p>
 * If tagging is enabled, then append a status tag to the RequestEvent.
 * @exception RequestException if the Request can't be submitted
 */
protected void processDestinations(RequestEvent request, Vector currentDestinations) throws RequestException {
      if (!enabled) {
            throw new RequestException("Transporter disabled");
      }
      if (currentDestinations == null)
            return;

      /* process FIFO/FEFR */
      Destination d = null;
      int size = currentDestinations.size();
      for (int i = 0; !request.isConsumed() && i < size; i++) {
            d = (Destination) currentDestinations.elementAt(i);
            d.requestEventPerformed(request);
            /* Try to tag the request */
            if (tagging)
                  request.setStatus (request.getStatus() + d);
      }
}
```

FIG. 26E

Transporter.requestEventPerformed(RequestEvent):AUS8-1999-0693

```
/**
 * Submit a synchronous request. For each Destination that is listening for
 * the current family of RequestEvents (the major code), send the RequestEvent
 * to the Destination for processing. If there is a problem, throw
 * a RequestException. Continue processing the RequestEvent as long
 * as a RequestException is not thrown by a Destination and the RequestEvent
 * is not consumed.
 * <p>
 * If tagging is enabled, then append a status tag to the RequestEvent.
 *<p>
 * Destinations are processed in the following FIFO order:
 * 1- All using "!" (priority).
 * 2- All using a major code.
 * 3- All using "*".
 *<p>
 * @exception RequestException if the Request can't be submitted
 */
public void requestEventPerformed(RequestEvent request) throws RequestException {
    if (!enabled) {
        throw new RequestException("Transporter disabled");
    }

    /* Try to tag the request */                                    2606
    if (tagging)
        request.setStatus(request.getStatus() + "[Transporter]");

    /* Process PRIORITY, major and then WILDCARD destinations */
    processDestinations(request, getDestinations(PRIORITY));
    processDestinations(request, getDestinations(request.getMajor()));
    processDestinations(request, getDestinations(WILDCARD));
}
```

FIG. 26F

```
/**
 * Submit an asynchronous request. See the synchronous
 * requestEventPerformed for more information.
 */
public void requestEventPerformed(RequestEvent request,
RequestResponseListener caller) throws RequestException {
    if (!enabled) {
        throw new RequestException("Transporter disabled");
    }
    if (tagging)
        request.setStatus(request.getStatus() +
            "[Transporter async.]");                                2608

    //start an inner class thread
    TransporterThread t = new TransporterThread(request, caller);
    runningThreads.put(request, t);
    t.start();
}
```

FIG. 26G

2610

Transporter.TransporterThread:AUS8-1999-0693

```
    /**
    * Private class to handle executions of submits() on another
thread.
    **/
    private class TransporterThread extends Thread {
        /**
        * The current request
        /**
        private RequestEvent request;

        /**
        * The caller of submit that we will call back
        **/
        private RequestResponseListener caller;


        /**
        * Create a transporter thread
        **/
        public TransporterThread(RequestEvent request,
RequestResponseListener caller) {
            super();
            this.request = request;
            this.caller = caller;
        }
        /**
        * Just call the synchronous version of
requestEventPerformed()
        **/
        public void run() {
            try {
                requestEventPerformed(request);
                caller.requestResponse(request);
            } catch (RequestException yikes); {
                caller.requestException(yikes);
            } finally {
                runningThreads.remove(request);
            }
        }
    }
```

FIG. 26H

Destination

FIG. 27A

2700

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 27B

2702

Methods

Name	Declaration	Description
getTimeout	public abstract long getTimeout()	Invoked to return the timeout value.
requestEventPerformed	public abstract void requestEventPerformed (RequestEvent request) throws RequestException	Invoked to process a RequestEvent.
setTimeout	public abstract void setTimeout(long timeout)	Invoked to set the timeout value in ms.

DestinationImpl

FIG. 28A

2800

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 28B

2802

Constructors

Name	Declaration	Description
DestinationImpl	public DestinationImpl()	Default constructor.

2804

Methods

Name	Declaration	Description
clear	public void clear()	By default, do nothing.
exit	public void exit()	By default, do nothing.
getJTCs	public Vector getJTCs()	By default, do nothing.
getTimeout	public long getTimeout()	Return the timeout value.
init	public void init()	By default, do nothing.
isEnabled	public boolean isEnabled()	Is the Destination enabled?
requestEventPerformed	public void requestEventPerformed (RequestEvent request) throws RequestException	A RequestEvent has arrived. If not enabled, throw an exception. Subclasses can call this method first to see if processing should continue.
setEnabled	public void setEnable(boolean enable)	Enable or disable the Destination. A Destination that is called when disabled will throw a RequestException. By default, record it.
setTimeout	public void setTimeout(long timeout)	Set the timeout value. By default, record it.
toString	public String toString()	Returns a String that represents the value of this object which is the class name and time timeout value.

FIG. 28C

RemoteDestination.requestEventPerformed(RequestEvent):AUS8-1999-0704

```
/**
 * Process request event.
 *
 * <P>PRE: None
 * <P>POST: None
 *
 * @param request the RequestEvent object to be processed.
 * @exception RequestException if there was an error during the
 *                              processing of the event.
 */
public void requestEventPerformed(RequestEvent request) throws
RequestException {
      try {
            Method method = null;
            if (session == null) {
                  // get home interface.
                  Context ctxt = getInitialContext();
                  Object home = ctxt.lookup(request.getMajor() +
"SessionHome");

                  method = home.getClass().getMethod("create", null);
                  session = method.invoke(home, null);
            }

            //get method on home object and invoke it.
            method = session.getClass().getMethod(request.getMinor(),
                  new Class[] {Object.class});
            request.setData(method.invoke(session, new Object[]
{request.getData()}));

            if (request.getMinor().equals("remove")) {
                session = null;
            }
      } catch (InvocationTargetException te) {
            throw new RequestException(te.getTargetException());
      } catch (Throwable t) {
            throw new RequestException(t);
      }
}
```

2806

FIG. 28D

Factory

Variables

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.

FIG. 29A 2900

FIG. 29B

2902

Methods

Name	Declaration	Description
list	public static void list()	Show the contents of the singletons.
newInstance	public static Object newInstance(String classname) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given a class name, create it and return it.
newInstance	public static Object newInstance(String classname, String key, boolean singleton) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given a class name, create the object and return it. If you want to create a singleton (true), then check to see if the object was already created and if so, return it. The class name is not used as the key but the 'key" parameter is.
newInstance	public static Object newInstance(String classname, boolean singleton) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given a class name, create the object and return it. If you want to create a singleton (true), then check to see if the object was already created and if so, return it. Use the class name as the key.
newInstances	public static Vector newInstances(String classnames[]) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given some class names, create and return a Vector of objects.
newInstances	public static Vector newInstances(String classnames[], String keys[], boolean singleton) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given some class names, create and return a Vector of objects. If you want singleton objects system wide, then if any of the classes were already created, return them, otherwise, create the new ones, remember them and return them. The class names are not used as the keys but the "keys" parameters are.
newInstances	public static Vector newInstances(String classnames[], boolean singleton) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given some class names, create and return a Vector of objects. If you want singleton objects system wide, then if any of the classes were already created, return them, otherwise, create the new ones, remember them and return them. Use the class name as the key.
removeInstance	public static void removeInstance(String key) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given a class key, clear the reference to it.
removeInstances	public static void removeInstances(String keys[]) throws ClassNotFoundException, InstantiationException, IllegalAccessException	Given some class keys, clear the references.

Interface com.ibm.jtc.JTC

Variables

FIG. 30A

3000

Name	Declaration	Description
_copyright	public static final String_copyright	(c) International Business Machines Inc., 1997 1998 1999. All rights reserved.
_version	public static final String_version	
_author	public static final String_author	
_email	public static final String_email	

FIG. 30B

3002

Methods

Name	Declaration	Description
clear	public abstract void clear()	Invoked to indicate that all memory allocations should be cleaned up. This includes removing listeners and flushing any lists (vectors or hashtables). A JTC object that has been cleared can be reused.
exit	public abstract void exit()	Invoked to indicate that all memory allocations should be cleaned up. This includes removing listeners and flushing any lists (vectors or hashtables). It also includes setting all variable references to null. A JTC object that has been cleared cannot be reused.
getJTCs	public abstract Vector getJTCs()	Invoked to get a Vector of all JTC objects that this JTC object has created. For example, a Transporter will at least return all of its Destinations. This is a very powerful mechanism. It allows us to get a reference to all primary objects in the JTC application and manipulate them according to the JTC methods, or by casting them to more specific classes or interfaces and manipulating them. Examples usage includes non code intrusive tracing, debugging, logging, profiling, etc.
init	public abstract void init()	Invoked to initialize the JTC object. The object should be ready for operation.
isEnabled	public abstract boolean isEnabled()	Invoked to determine if the JTC object is enabled.
setEnabled	public abstract void setEnabled (boolean enable)	Invoked to enable or disable the JTC object.
toString	public abstract String toString()	Invoked to get a String representation of the JTC object.

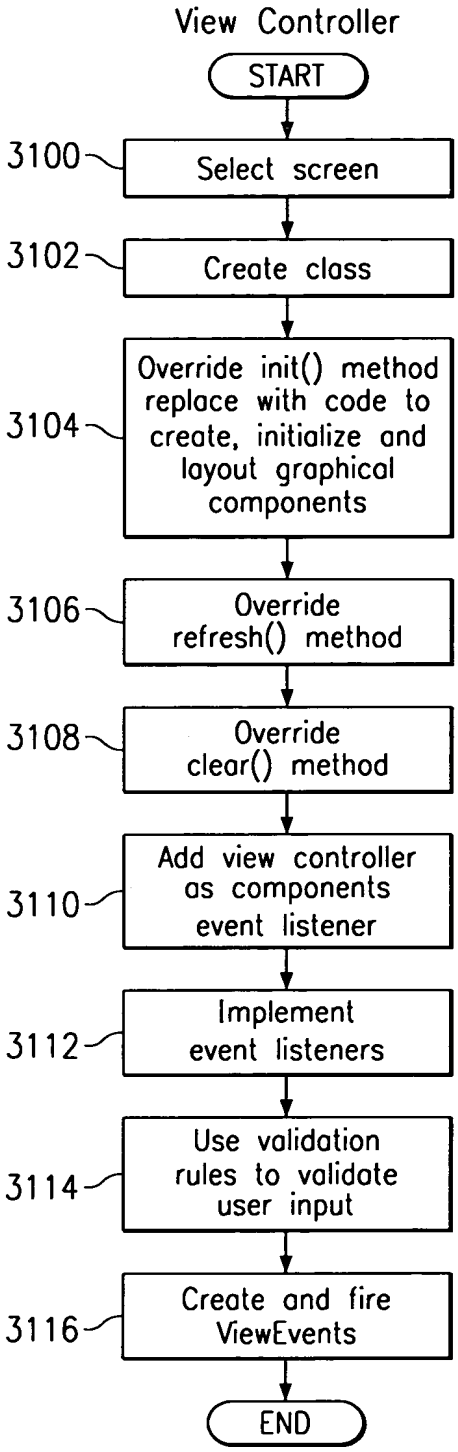


FIG. 31

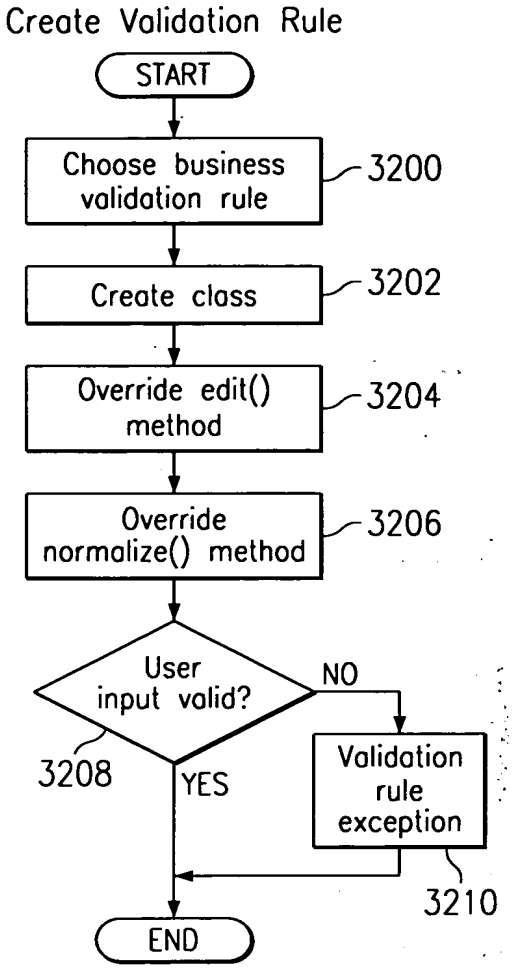


FIG. 32

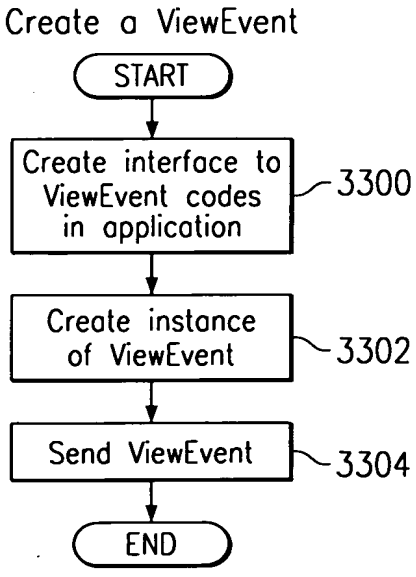


FIG. 33

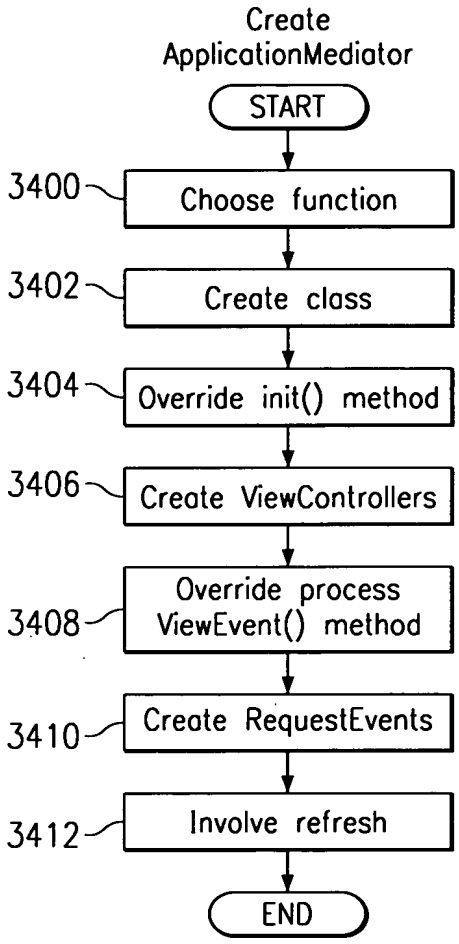


FIG. 34

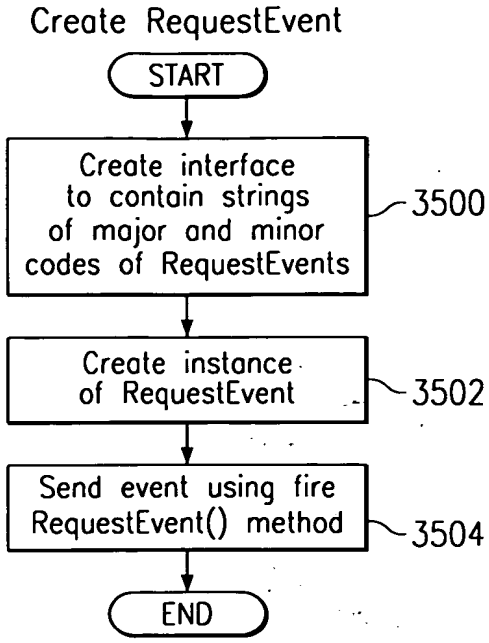


FIG. 35

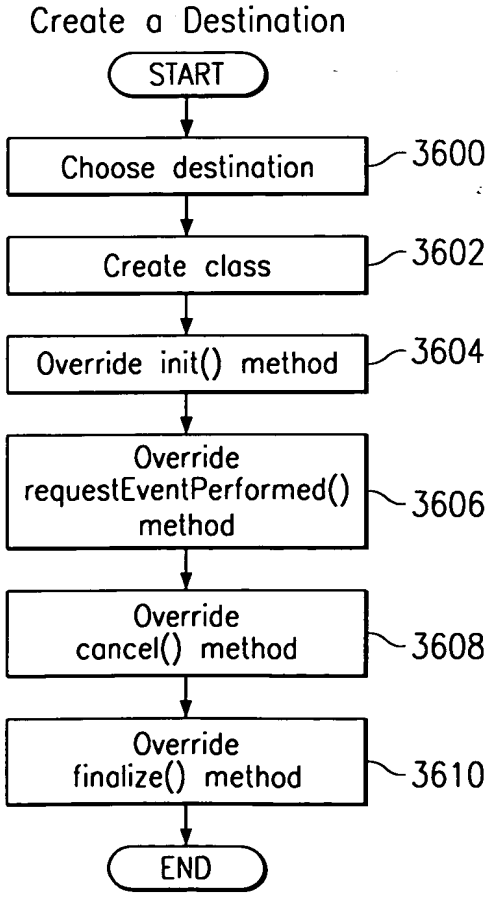


FIG. 36

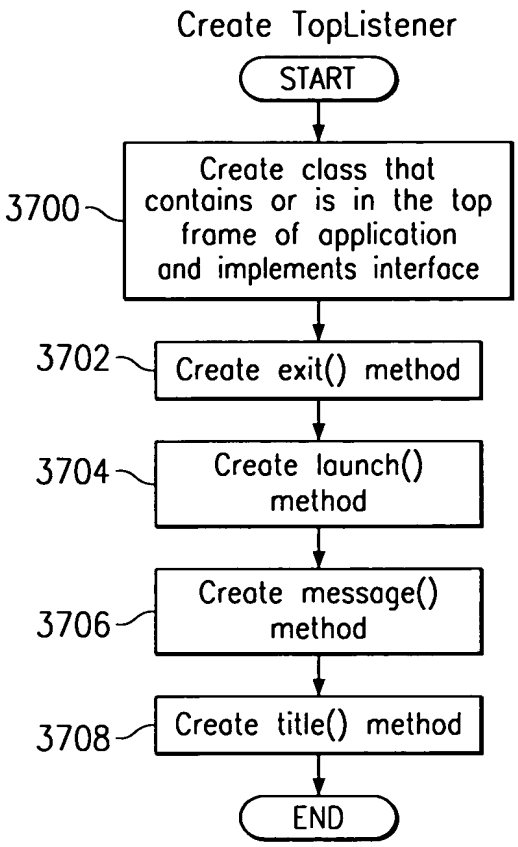

Create TopListener
START
Create class that contains or is in the top frame of application and implements interface
3700
Create exit() method
3702
Create launch() method
3704
Create message() method
3706
Create title() method
3708
END

FIG. 37

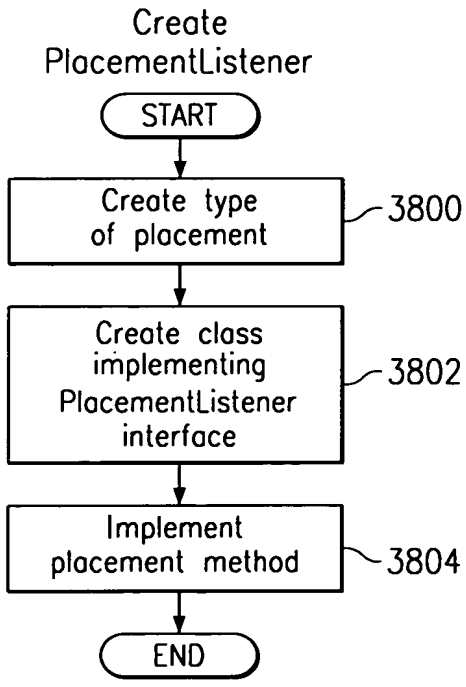

Create PlacementListener
START
Create type of placement
3800
Create class implementing PlacementListener interface
3802
Implement placement method
3804
END

FIG. 38

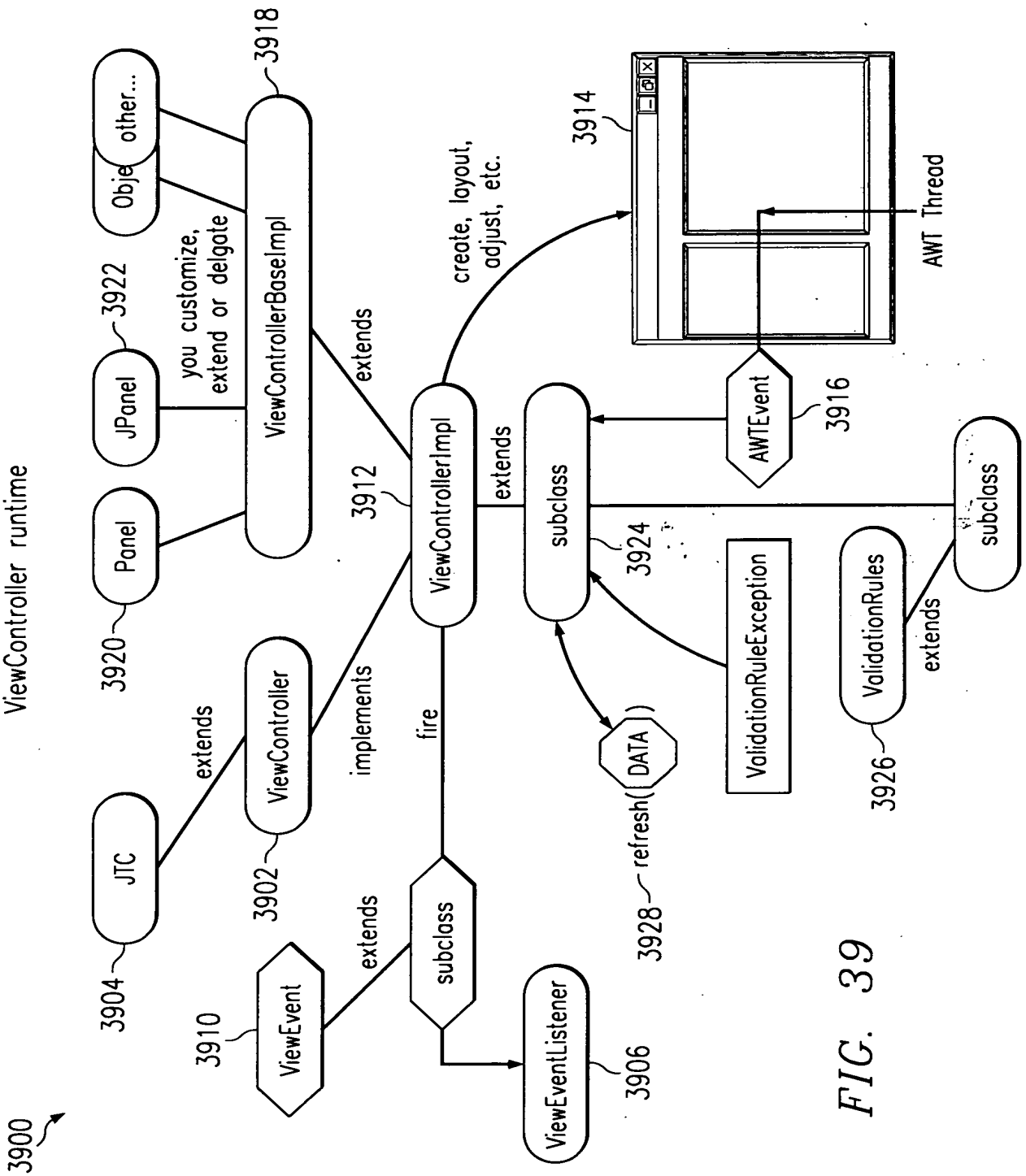

ViewController runtime
3900
JTC
3904
ViewEvent
3910
ViewController
3902
Panel
3920
JPanel
3922
Obje
other...
ViewControllerBaseImpl
3918
extends
implements
you customize,
extend or delgate
extends
fire
subclass
ViewEventListener
3906
ViewControllerImpl
3912
extends
create, layout,
adjust, etc.
3914
AWT Thread
subclass
3924
AWTEvent
3916
ValidationRuleException
DATA
refresh(
3928
ValidationRules
3926
extends
subclass

FIG. 39

Basic Operation of a ViewControllerImpl

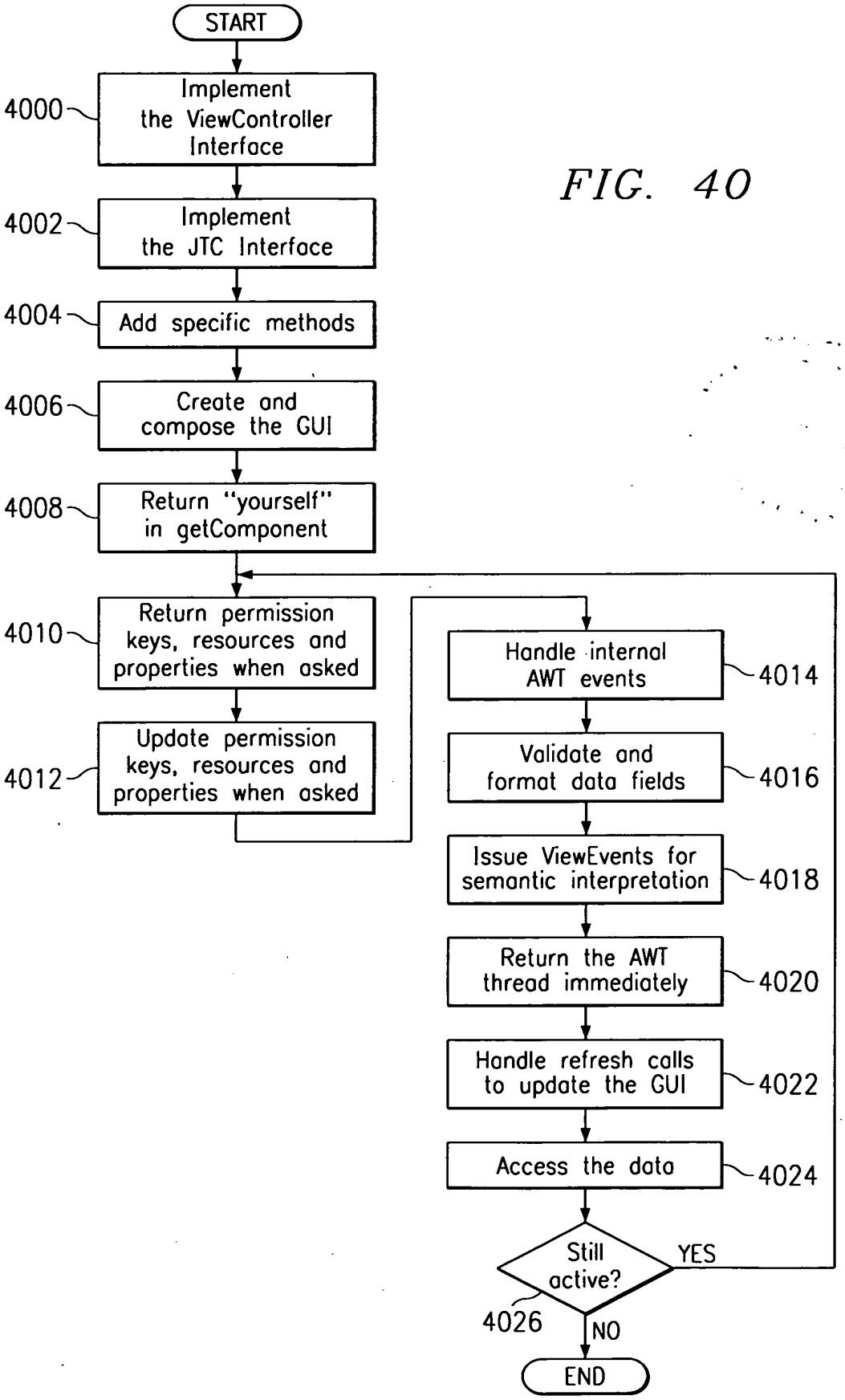


FIG. 40

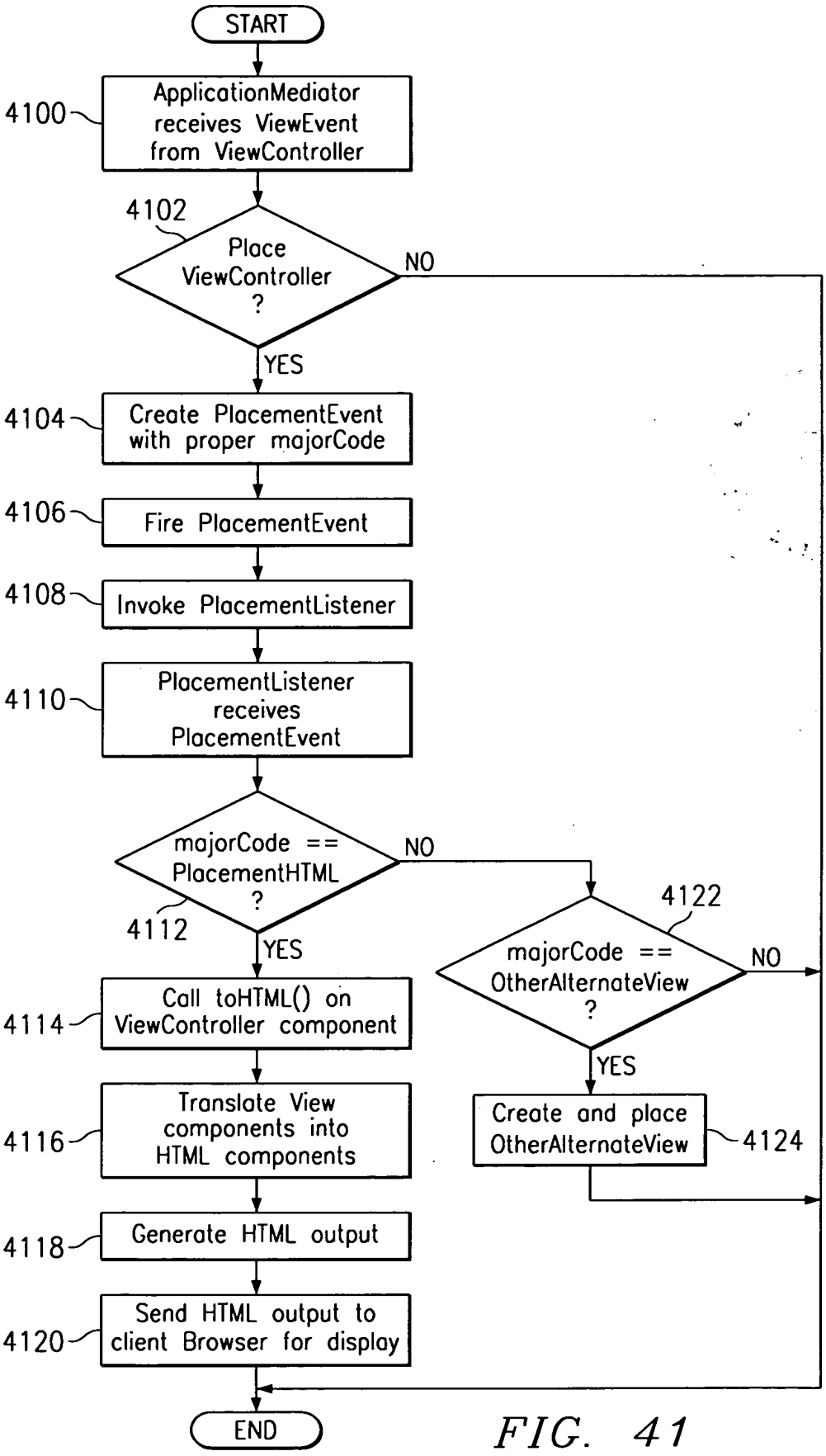

START
4100
ApplicationMediator receives ViewEvent from ViewController
4102
Place ViewController ?
NO
YES
4104
Create PlacementEvent with proper majorCode
4106
Fire PlacementEvent
4108
Invoke PlacementListener
4110
PlacementListener receives PlacementEvent
majorCode == PlacementHTML ?
4112
NO
YES
4122
majorCode == OtherAlternateView ?
NO
YES
4114
Call toHTML() on ViewController component
4116
Translate View components into HTML components
4118
Generate HTML output
4120
Send HTML output to client Browser for display
Create and place OtherAlternateView
4124
END

FIG. 41

ViewEvent and ViewListener Usage

```
→ Usage from a ViewController
  public void actionPerformed(ActionEvent e) {
      if (e.getSource() == nextButton) {
          ViewEvent ve = new ViewEvent (this);
          ve.setMajor(ViewEvent.NEXT);
          fireViewEvent(ve); //notify
      ViewEvent listener
          return;
      }
  }
```

FIG. 42

```
→ Usage from ViewListener (i.e. ApplicationMediator)
  //add myself as a listener
  customerDetailsViewController.addViewListener(this);

  //later, we are called back on this method to handle the
ViewEvent
  processViewEvent (ViewEvent event) {
      //do something
      switch (event.getMajor()) {
         case ViewEvent.NEXT: //...
         break;
         case ViewEvent.OK: //...
         break;
      }
  }
```

FIG. 43

Major and/or minor codes

→ Pre-defined major codes- A subclass can define others.

- // system
  - OK DONE OPEN CLOSE CANCEL EXIT FILE SAVE SAVEAS ERROR WARNING RETURN LOAD NOTIFY NOTIFY2 INFO SETUP PRINT LOGIN LOGOUT ENABLE DISABLE
- // status
  - TITLEMESSAGE STATUSMESSAGE ERRORMESSAGE SUGGESTIONMESSAGE
- // navigational
  - NEXT PREVIOUS FIRST LAST START BEGIN END PAUSE STOP RESTART SUBMIT BACKSPACE INSERT HOME PGUP PGDN LEFT RIGHT UP DOWN
- // live
  - FAST MEDIUM SLOW RUN DELAY WAIT TIMER ON OFF HIGH LOW
- // data related
  - LIST MORE ADD DELETE MODIFY NEW EDIT COPY CUT PASTE UNDO REMOVE PLUS MINUS INCREMENT DECREMENT CHANGED FILL EMPTY READY VIEW DETAILS READ WRITE UPDATE REFRESH
- // assit related
  - SEARCH FIND HELP HINT TRAIN TEACH SUGGEST
- // sub options related
  - A B C D E F OPTION CHOOSE
- // test values
  - TRACE UNTRACE DEBUG UNDEBUG LOG UNLOG HOOK UNHOOK
- // ibm values

TEAM WIN EXECUTE

FIG. 44

ValidationRules Usage

→ Examples:

```
edit("123456") -> $1234.56
normalize("$1234.56") -> 123456
edit("12345x") -> ValidationRuleException
```

→ edit

```
//validate and re-display
String value = textfield.getText();
try {
    result = SocialSecurity.edit(value);
}
catch (ValidationRuleException yikes) {
    //...
    return;
}
textField.setText(value);
```

FIG. 45

→ normalize

```
//validate and update the data objects
String value = textfield.getText();
try {
    result = SocialSecurity.normalize(value);
}
catch (ValidationRuleException yikes) {
    //message box ...
    return;
}
dataObject.setText(value);
```

FIG. 46

ValidationRules Usage

→ Example Chaining

```
//each rule
String range = "com.xyz.jtc.RangeChecker";
String money = "com.xyz.jtc.AccountMoney";

//build the chain of rules
String[] rules = {range, money};

//get the value to validate
String value = textField.getText();

try {
    value = applyEdits(rules, input);

}
catch (ValidationRuleException ouch) {
    //...
}

//the value is validated and formatted, redisplay
textField.setText(value);
```

FIG. 47

ViewControllerBaseImpl

→ For example:

• inheritance

```
public class ViewControllerBaseImpl extends JPanel {
    public Component getComponent() {
    return this;
    }
}
```

FIG. 48

• delegation

```
public class ViewControllerBaseImpl implements ViewController
{
    XYZ xyz = new XYZ();

    public java.awt.Component getComponent() {
        return xyz;
    }

    public void setEnabled(boolean e) {
        xyz.setEnabled(e);
    }

    public void setVisible(boolean v) {
        xyz.setVisible(v);
    }
}
```

FIG. 49

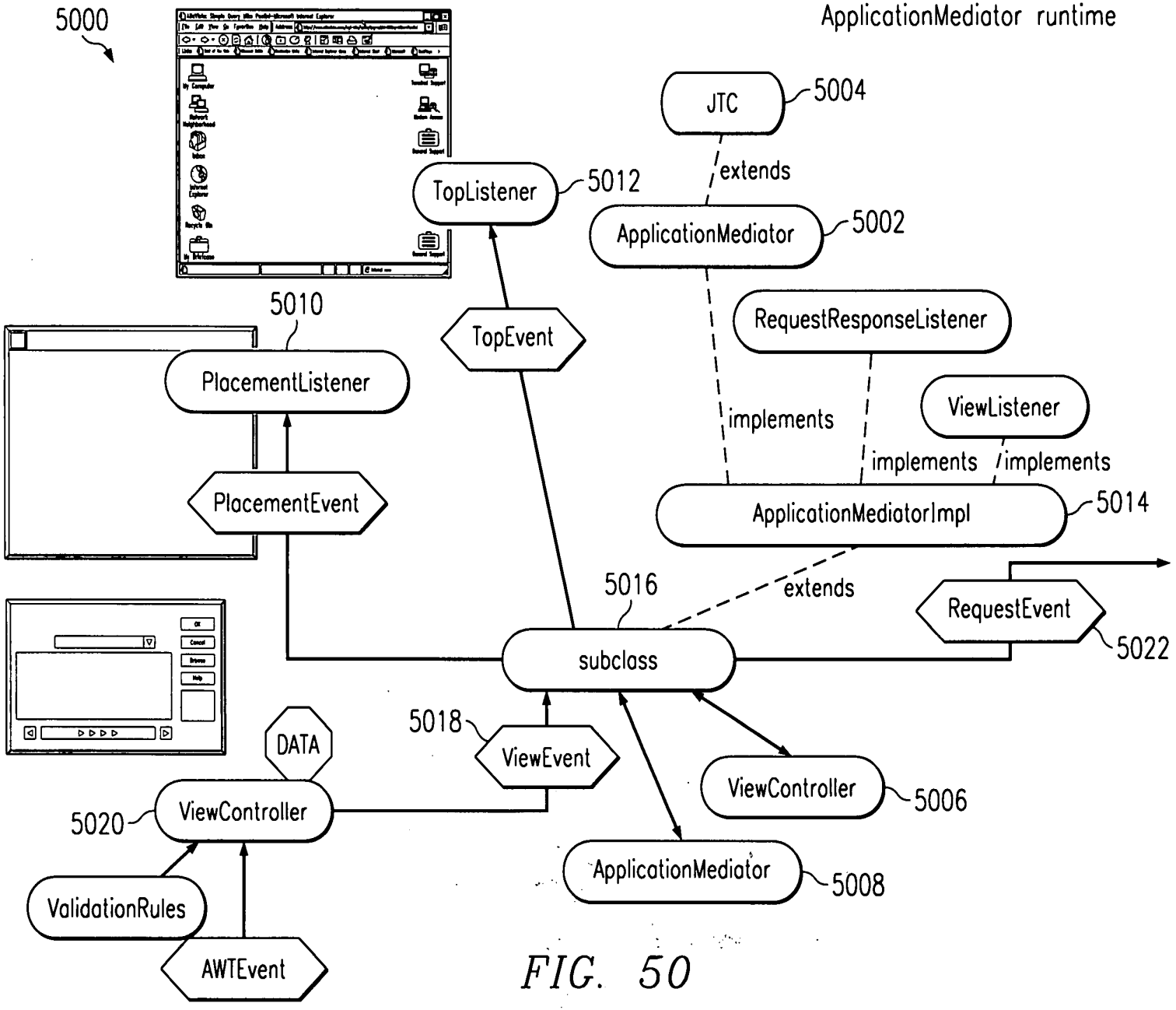

5000
ApplicationMediator runtime
JTC
5004
extends
TopListener
5012
ApplicationMediator
5002
5010
TopEvent
RequestResponseListener
PlacementListener
implements
ViewListener
implements
implements
PlacementEvent
ApplicationMediatorImpl
5014
5016
extends
RequestEvent
5022
subclass
5018
DATA
ViewEvent
ViewController
5006
5020
ViewController
ApplicationMediator
5008
ValidationRules
AWTEvent

FIG. 50

AWTEvent threading support

- Style 1 – wait/Queue/notify
- Style 2 – Thread dispatch
- Handles Threading Model for ViewControllers

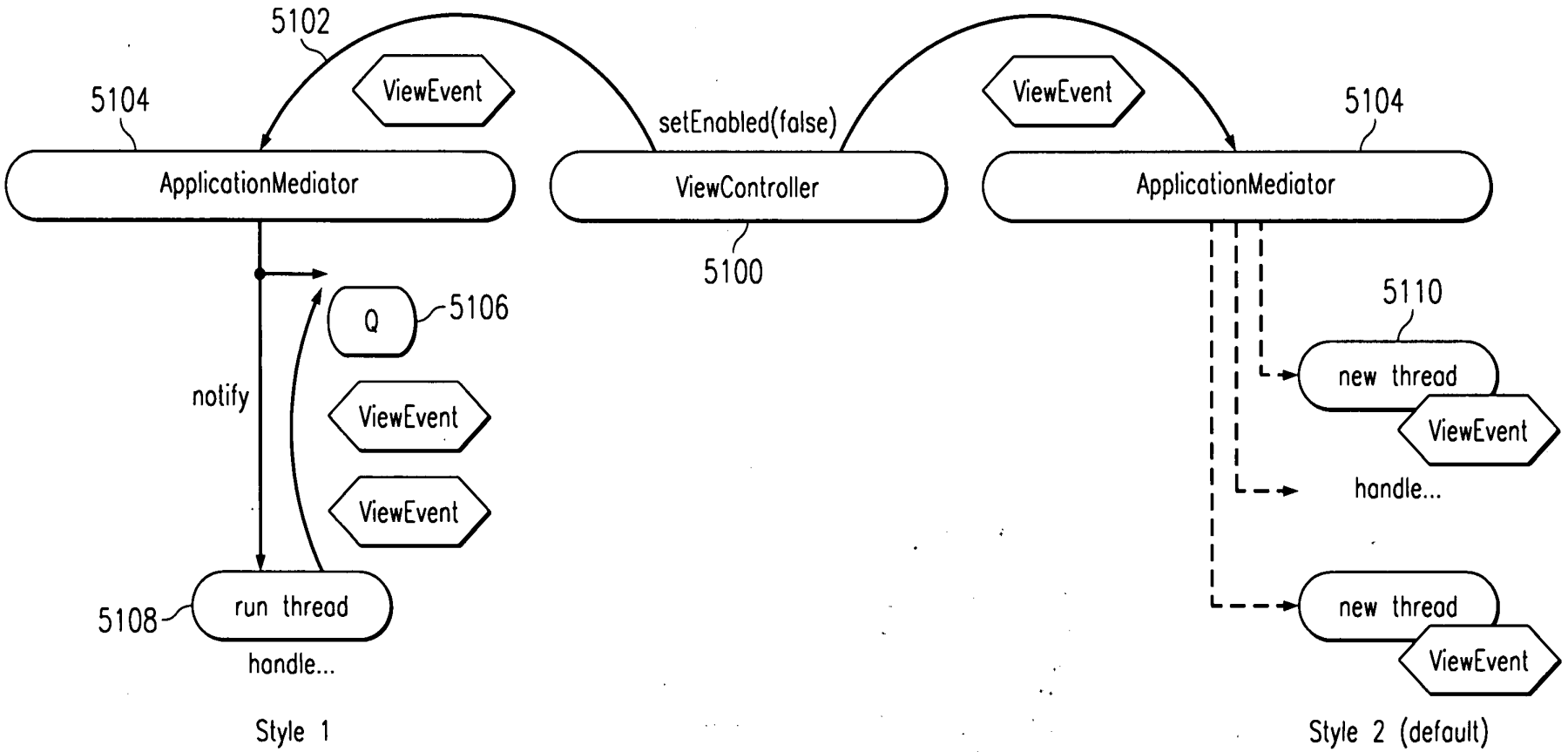


FIG. 51

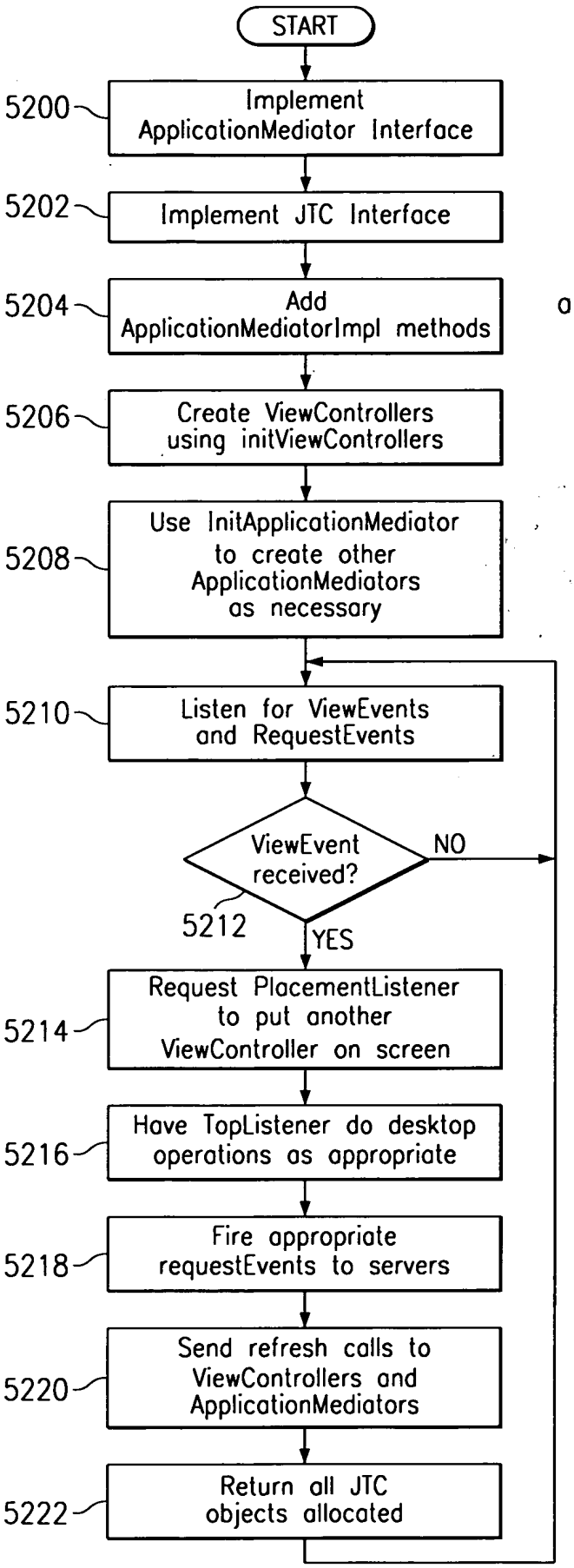


FIG. 52

Design Steps for an ApplicationMediator

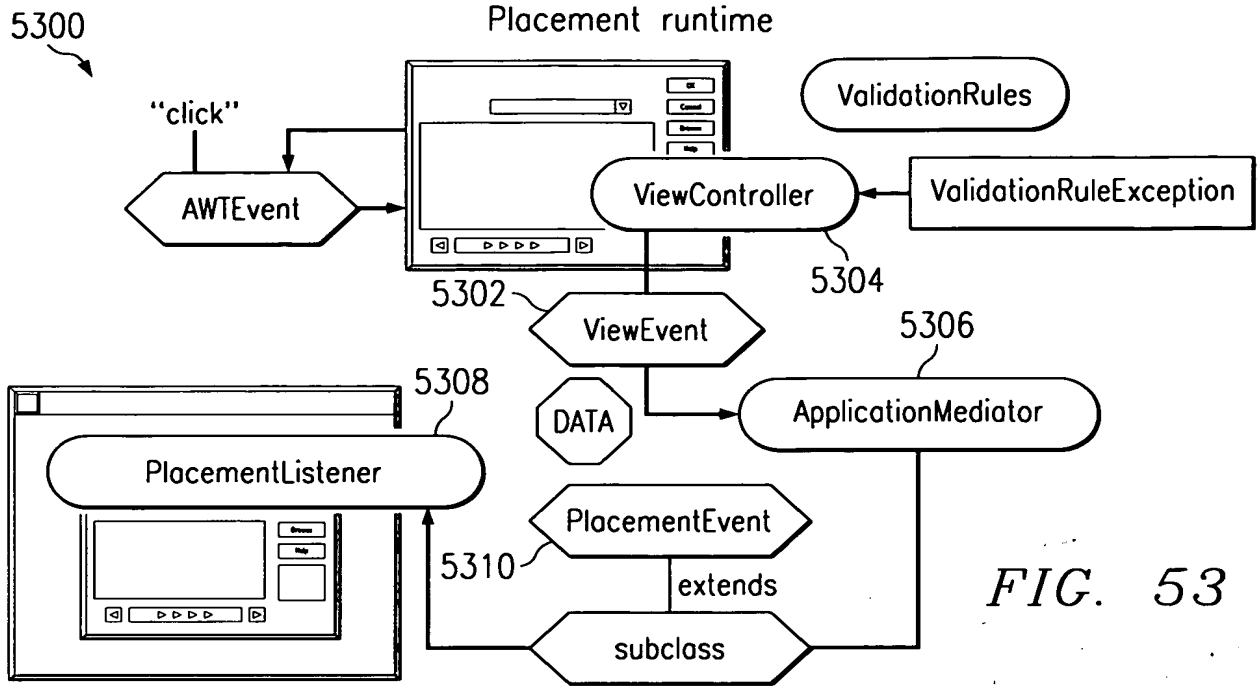


FIG. 53

Placement example

```
→ Usage from ApplicationMediator
        //in an ApplicationMediator
        int major = PlacementEvent.ADD;
        Component component =
        customerDetailsViewController.getComponent();
        PlacementEvent e = new PlacementEvent(this, component, major);
        firePlacementEvent(e);
```

FIG. 54

```
→ Usage from PlacementListener
        public class MyProgram implements PlacementListener {
            public void placementEventPerformed(PlacementEvent e) {
                //decide based on source type
                switch (e.getMajor()) {

                    case PlacementEvent.ADD:
                        if (e.getSource() instanceof PreferencesAm)
                            panel1.add("Center", e.getComponent());
                        else panel2.add("A", e.getComponent());
                    break;
                    case PlacementEvent.REMOVE:
                        //do something else
                    break;
                }
            //etc.
            }
        }
```

FIG. 55

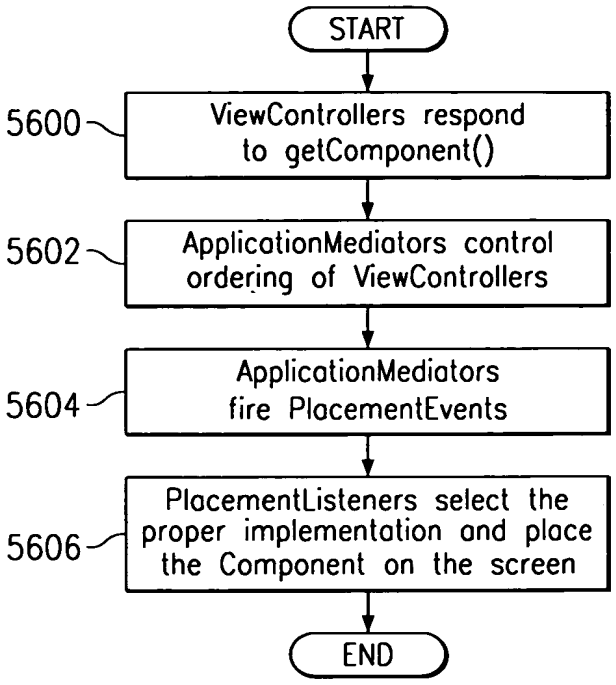


FIG. 56
Design Steps for a PlacementEvent

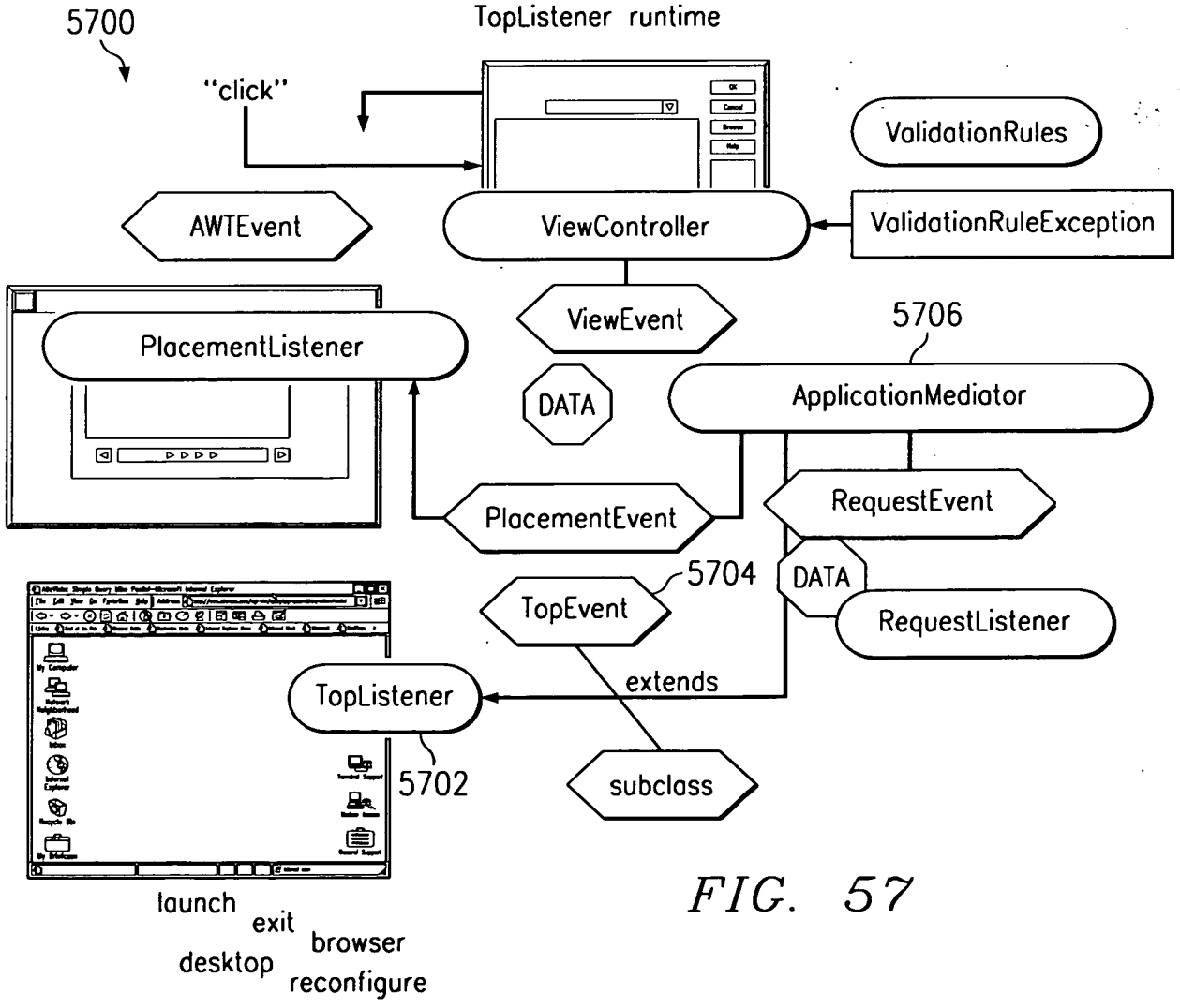


FIG. 57

TopListener example

```
//from the TopListener
ApplicationMediatorXYZ m = new ApplicationMediatorXYZ();
m.addTopListener(this);
```

FIG. 58

```
//in the ApplicationMediator
String status = "Loading files...";
TopEvent e = new TopEvent(this, TopEvent.STATUS, 0, status);
fireTopEvent(e);
```

FIG. 59

```
//later in the TopListener callback
public void topEventPerformed(TopEvent e) {
    switch(e.getMajor()) {
        case STATUS:
            //access the browser
        break;
        /etc.
    }
}
```

FIG. 60

RequestEvent example

```
//from an ApplicationMediator - create event
RequestEvent r = new RequestEvent();
r.setMajor ("Loans");
r.setMinor("SubmitCustomerInfo");
```

FIG. 62

```
//fire an asynchronous event
try {
    //asynchronous
    fireRequestEvent(this, r);
}
catch (RequestException yikes) {}
```

FIG. 63

```
//later, called back with success
public void requestResponse(RequestEvent result) {
    //process response
}

//or failure
public void requestException(RequestException yikes) {
    //now what?
}
```

FIG. 64

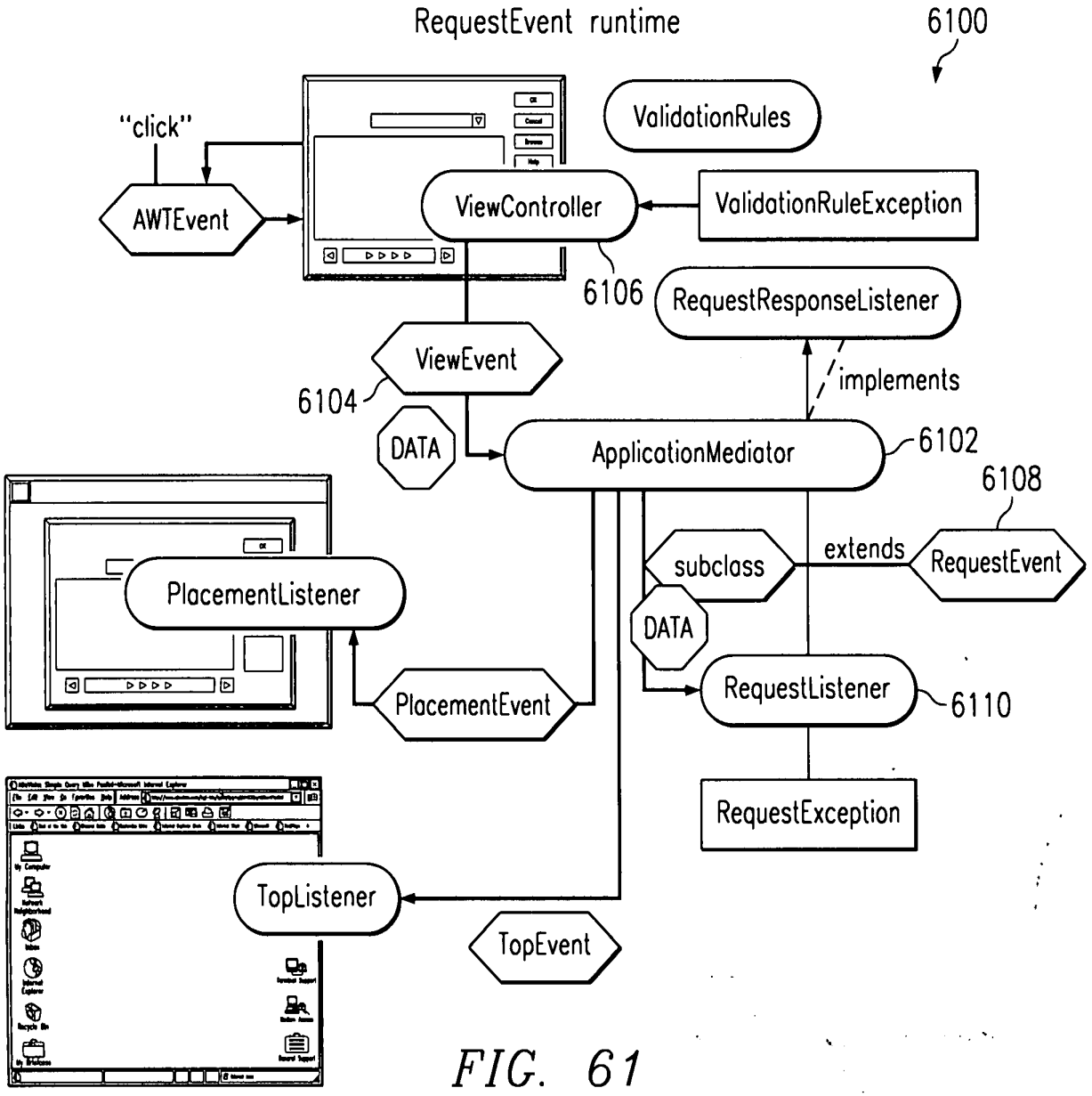

RequestEvent runtime
6100
"click"
AWTEvent
ViewController
ValidationRules
ValidationRuleException
6106
RequestResponseListener
implements
ViewEvent
6104
DATA
ApplicationMediator
6102
6108
PlacementListener
subclass
extends
RequestEvent
DATA
PlacementEvent
RequestListener
6110
RequestException
TopListener
TopEvent

FIG. 61

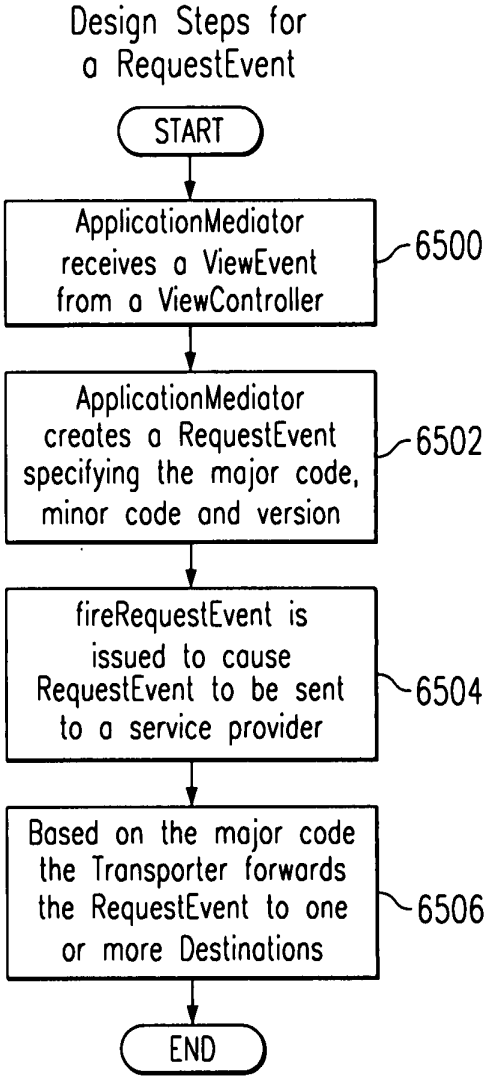

Design Steps for
a RequestEvent
START
ApplicationMediator
receives a ViewEvent
from a ViewController
6500
ApplicationMediator
creates a RequestEvent
specifying the major code,
minor code and version
6502
fireRequestEvent is
issued to cause
RequestEvent to be sent
to a service provider
6504
Based on the major code
the Transporter forwards
the RequestEvent to one
or more Destinations
6506
END

FIG. 65

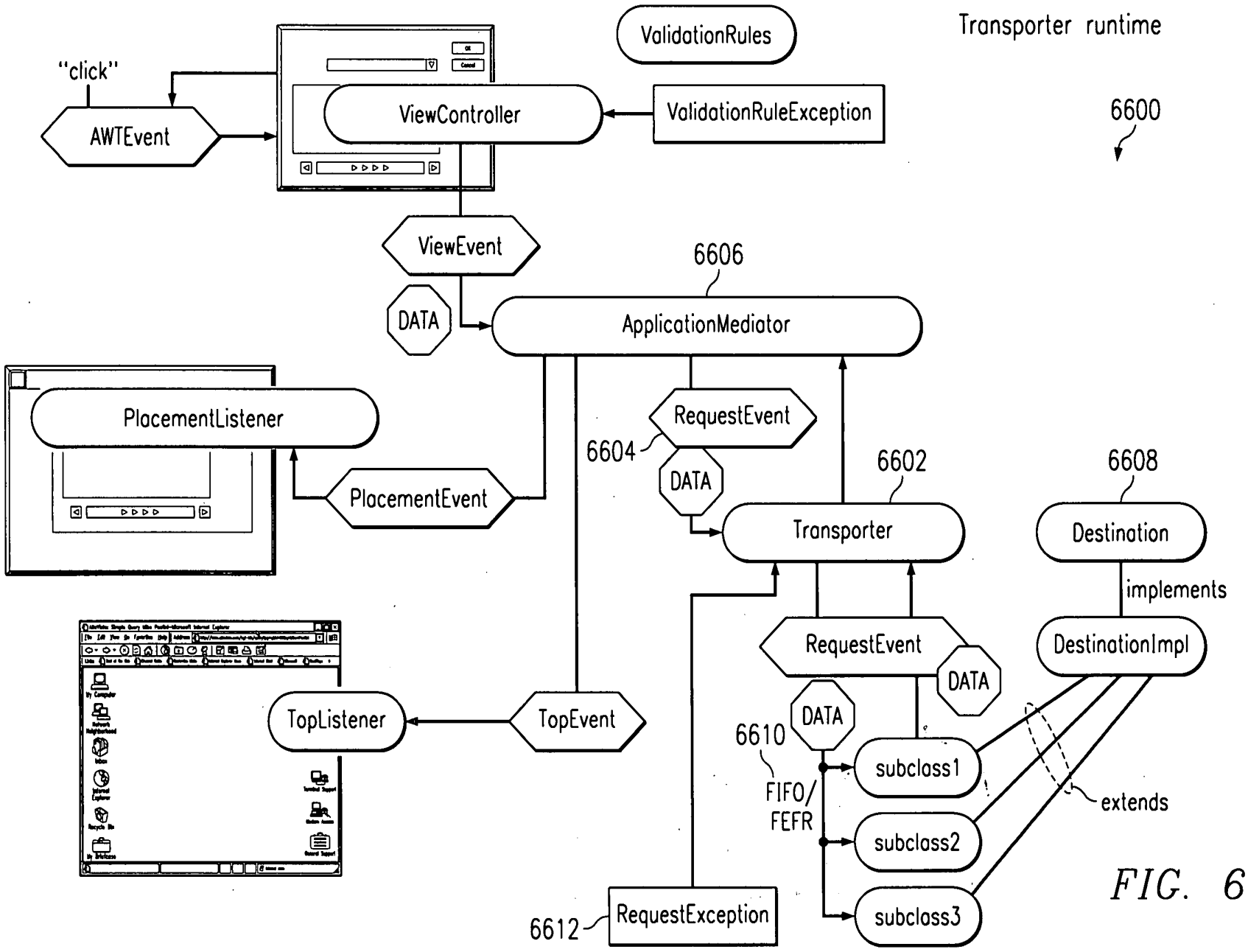

Transporter runtime
6600
ValidationRules
"click"
AWTEvent
ViewController
ValidationRuleException
ViewEvent
6606
DATA
ApplicationMediator
PlacementListener
PlacementEvent
RequestEvent
6604
DATA
6602
Transporter
6608
Destination
implements
DestinationImpl
RequestEvent
DATA
DATA
6610
FIFO/
FEFR
subclass1
subclass2
subclass3
extends
TopListener
TopEvent
6612
RequestException

FIG. 66

Transporter

- This class implements the JTC and RequestEventListener interfaces
- Its primary function is to map RequestEvents to Destinations.
  - Typically ApplicationMediators fire RequestEvents and Destinations process them
- Add a Transporter to an ApplicationMediator to listen for RequestEvents

```
Transporter t = new Transporter();
ApplicationMediator am = new ApplicationMediator();
am.addRequestListener(t);
```

- The ApplicationMediator will fire RequestEvents

```
RequestEvent r = new RequestEvent(source, major, minor, data);
try {
    fireRequestEvent(r);
}
catch (RequestException yikes) {}
```

FIG. 67

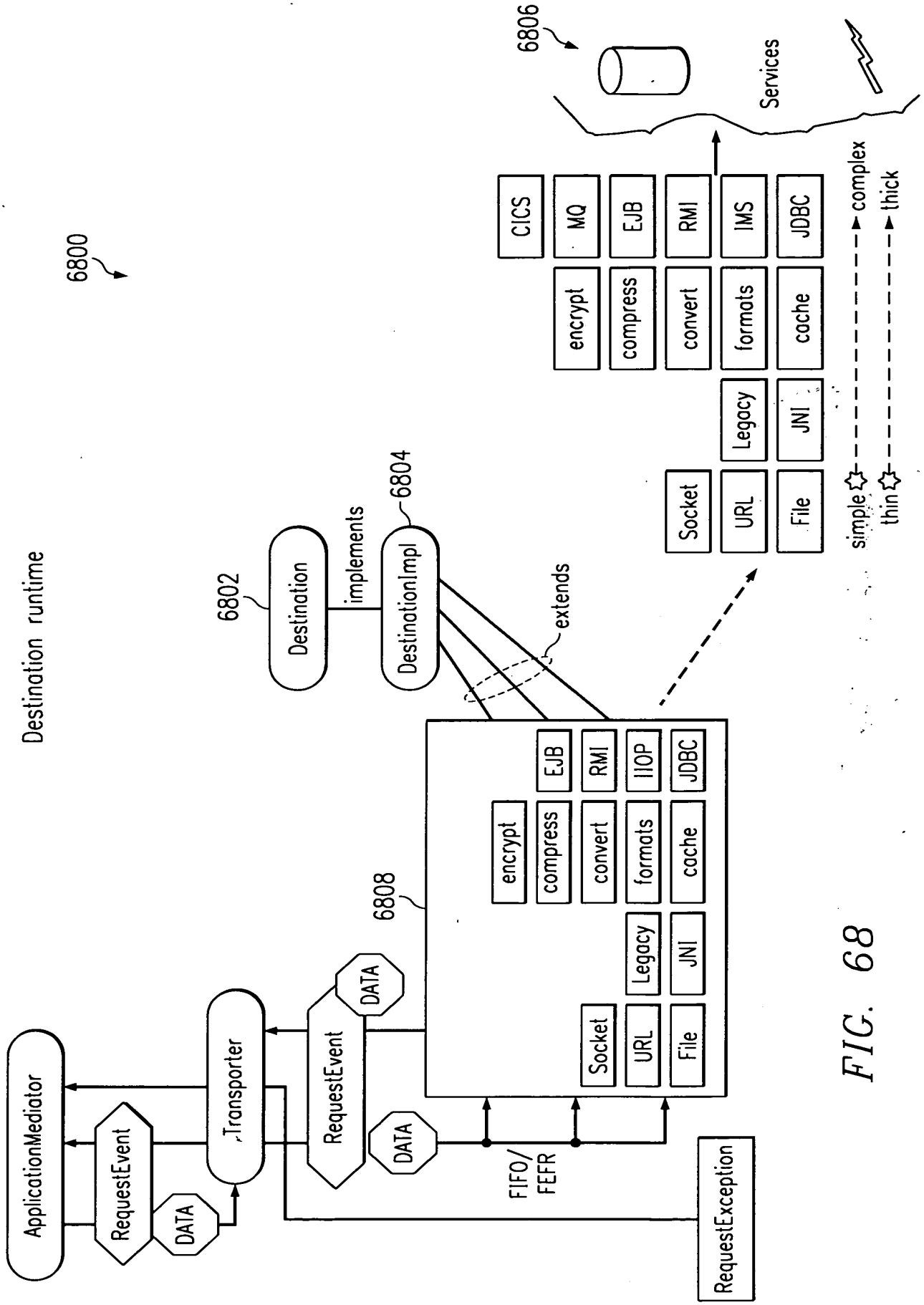

6800
Destination runtime
6802
Destination
implements
6804
DestinationImpl
extends
6806
Services
CICS
MQ
EJB
RMI
IMS
JDBC
encrypt
compress
convert
formats
cache
Socket
URL
File
Legacy
JNI
simple
thin
complex
thick
6808
EJB
RMI
IIOP
JDBC
encrypt
compress
convert
formats
cache
Socket
URL
File
Legacy
JNI
ApplicationMediator
RequestEvent
DATA
Transporter
RequestEvent
DATA
DATA
FIFO/
FEFR
RequestException

FIG. 68

Destination

- RequestEvents are identified by
  - major code – represents a family of Requests
  - minor code – represents a specific Request
- Destinations are added to the Transporter as DestinationListeners specifing a major code for RequestEvents they are interested in receiving
- The destination is called when the major code of the RequestEvent matches the destination major code

```
EJBDestination d = new EJBDestination();
Transporter t = new Transporter();
String major = "Loans";
t.addDestinationListener(major, d);
```

- Multiple Destinations can listen for the same RequestEvent major code
  - processed FIFO/FESP (first in first out, first exception stop forwarding)
  - results of one Destination can be passed to the next Destination

FIG. 69

Destinations and major codes

- Special major codes
  - wildcard
    - "*" major code indicates the Destination is interested in all and any RequestEvents
    - processed after specific major codes have been matched.
  - priority
    - "!" major code indicates the Destination is interested in all requests and should be given priority.
    - processing performed before specific major codes and wildcards
- For example

```
Transporter t = new Transporter();
t.addDestinationListener ("*", new WildDestination ());
t.addDestinationListener ("Loans", new EJBDestination());
t.addDestinationListener ("!", new PriorityDestination());

//later
RequestEvent r = new RequestEvent(this, "Loans", " ", null);
try {
    fireRequestEvent(r);
}
catch (RequestException yikes) {}
```

- The RequestEvent "r" will be sent to PriorityDestination 1st, EJBDestination 2nd, and WildDestination() 3rd, assuming no RequestExceptions are thrown.

FIG. 70

getJTCs example

```
// Recursively look at the root, find each JTC and/or AWT and hook
public void hookJTCs(JTC root) {
    Vector jtcs = null;
    try {
        jtcs = root.getJTCs();
    } catch (Exception none) { return; } // should not happen

    if (jtc == null) return; //we are done

    int size = jtcs.size();
    for (int j = 0; j < size; j++) {
        Object current = jtcs.elementAt(j);
        if (current instanceof ApplicationMediator) {
            hookAM((ApplicationMediator) current);
        } else
            if (current instanceof ViewController) {
                hookVC((ViewController) current);
            } else
                if (current instanceof Transporter) {
                    hookTransporter((Transporter) current);
                } else
                    if (current instanceof java.awt.Component) {
                        //once into AWT tree, never back to JTCs
                        hookAWTs((java.awt.Component) current);
                        continue;
                    }
        hookJTCs((JTC) jtcs.elementAt(j)); //recursive
    }
}
```

FIG. 71

hookJTC helpers

```
/**
 * Hook the ApplicationMediator
 */
public void hookAM(ApplicationMediator am) {
    vc1.refresh("ApplicationControllers found:" + am);
    am.addViewListener(this);
    am.addRequestListener(this);
    vc1.refresh("....add as ViewListener");
    vc1.refresh("....add as RequestListener");
}

/**
 * Hook the ViewController and it's getComponent()
 */
public void hookVC(ViewController vc) {
    vc1.refresh("ViewController found:" + vc);
    vc.addViewListener(this);
    vc1.refresh("....add as ViewListener");
    hookAWTs(vc.getComponent());
}

/**
 * Hook the Transporter
 */
public void hookTransporter(Transporter transporter) {
    vc1.refresh("Transporter found:" + transporter);
    transporter.addDestinationListener("!", this);
    vc1.refresh("....add as ! DestinationListener");
}
```

FIG. 72

hookAWTs

```
//Recursively find each AWT object and hook
public void hookAWTs(Component comp) {
    if (component instanceof Container) {
        vc1.refresh("Container found:" + comp);
        Component[] comps = ((Container) comp).getComponents();
        int size = comps.length;
        for (int i = 0; i < size; i++) {
            hookAWTs(comps[i]);
        }
    }
    /* continue here since some regular Components, such as JLabels,
    * are Containers also.
    */
    if (comp instanceof Button) {
        hookAWTButton((Button) comp);
    } else
        if (comp instanceof JButton) {
            hookSwingJButton((JButton) comp);
        } else
            if (component instanceof JTextField) {
                hookSwingJTextField((JTextField) comp);
            }
            /*...else do over every other Bean/Component/Container
            * type possibly using reflection or a table driven
            * implementation.
            */
}
```

FIG. 73

hookAWTs - helpers

```
/**
 * Hook the java.awt.Button
 */
public void hookAWTButton(Button button) {
    vc1.refresh("java.awt.Button found:" + button);
    button.addActionListener(this);
    vcl.refresh("....add as ActionListener");
}
/**
 * Hook the com.sun.java.swing.JButton
 */
public void hookSwingJButton(JButton button) {
    vc1.refresh("com.sun.java.swing.JButton found:"+ button);
    button.addActionListener(this);
    button.addChangeListener(this);
    button.addItemListener(this);
    vc1.refresh("....add as ActionListener");
    vc1.refresh("....add as ChangeListener");
    vc1.refresh("....add as ItemListener");
}
/**
 * Hook the com.sun.java.swing.JTextField
 */
public void hookSwingJTextField(JTextField textfield) {
    vc1.refresh("com.sun.java.swing.JTextField found:" textfield);
    textfield.addActionListener(this);
    textfield.addCaretListener(this);
    vc1.refresh("....add as ActionListener");
    vc1.refresh("....add as CaretListener");
}
```

FIG. 74

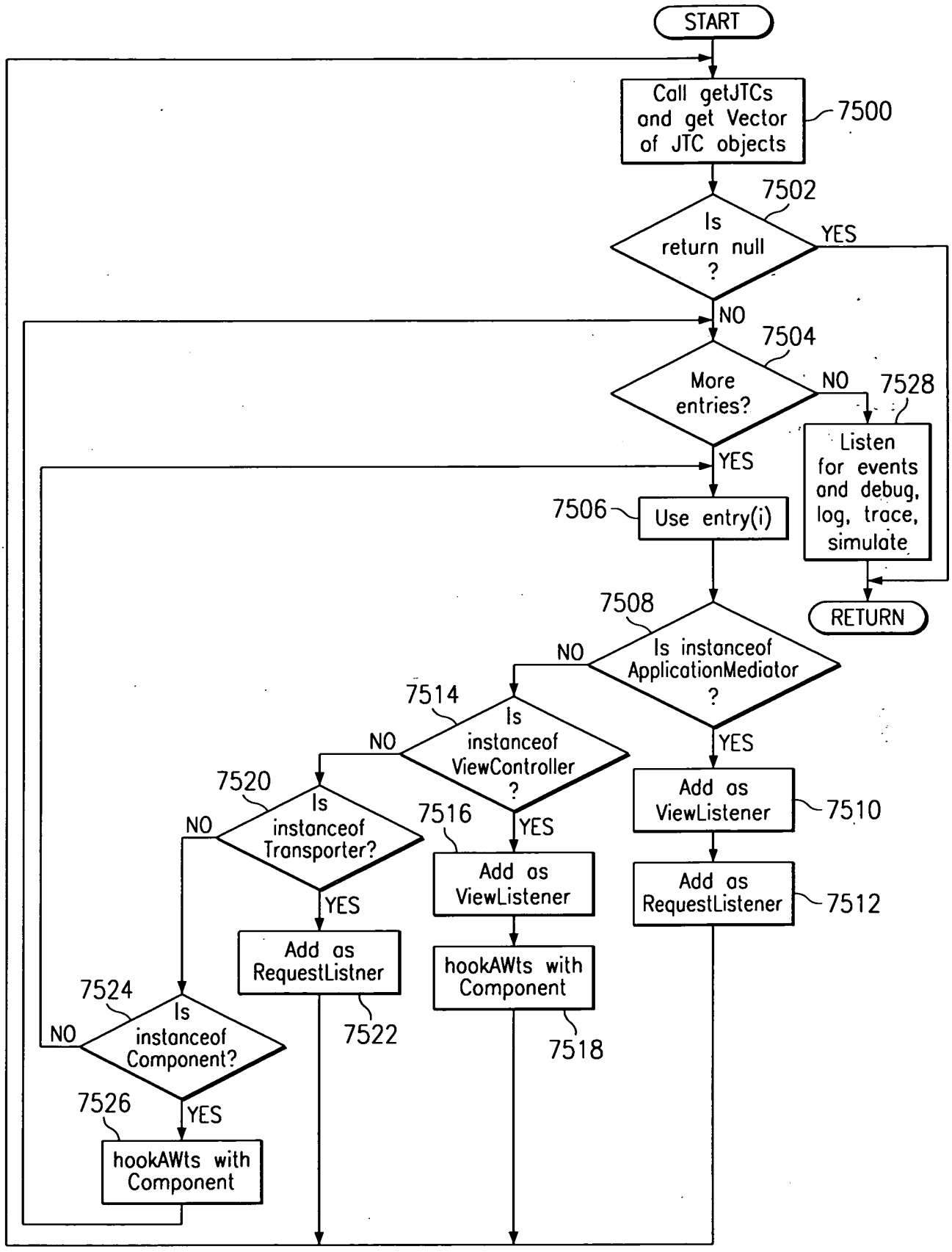

START
Call getJTCs and get Vector of JTC objects
7500
7502
Is return null ?
YES
NO
7504
More entries?
NO
7528
Listen for events and debug, log, trace, simulate
YES
7506
Use entry(i)
RETURN
7508
Is instanceof ApplicationMediator ?
NO
YES
7514
Is instanceof ViewController ?
NO
YES
Add as ViewListener
7510
Add as RequestListener
7512
7520
Is instanceof Transporter?
NO
YES
7516
Add as ViewListener
hookAWts with Component
7518
Add as RequestListner
7522
7524
Is instanceof Component?
NO
YES
7526
hookAWts with Component

FIG. 75

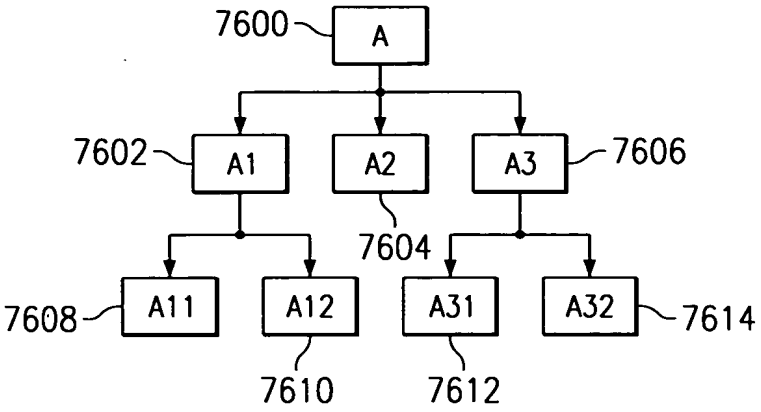

7600
A
7602
A1
A2
A3
7606
7604
7608
A11
A12
A31
A32
7614
7610
7612

FIG. 76

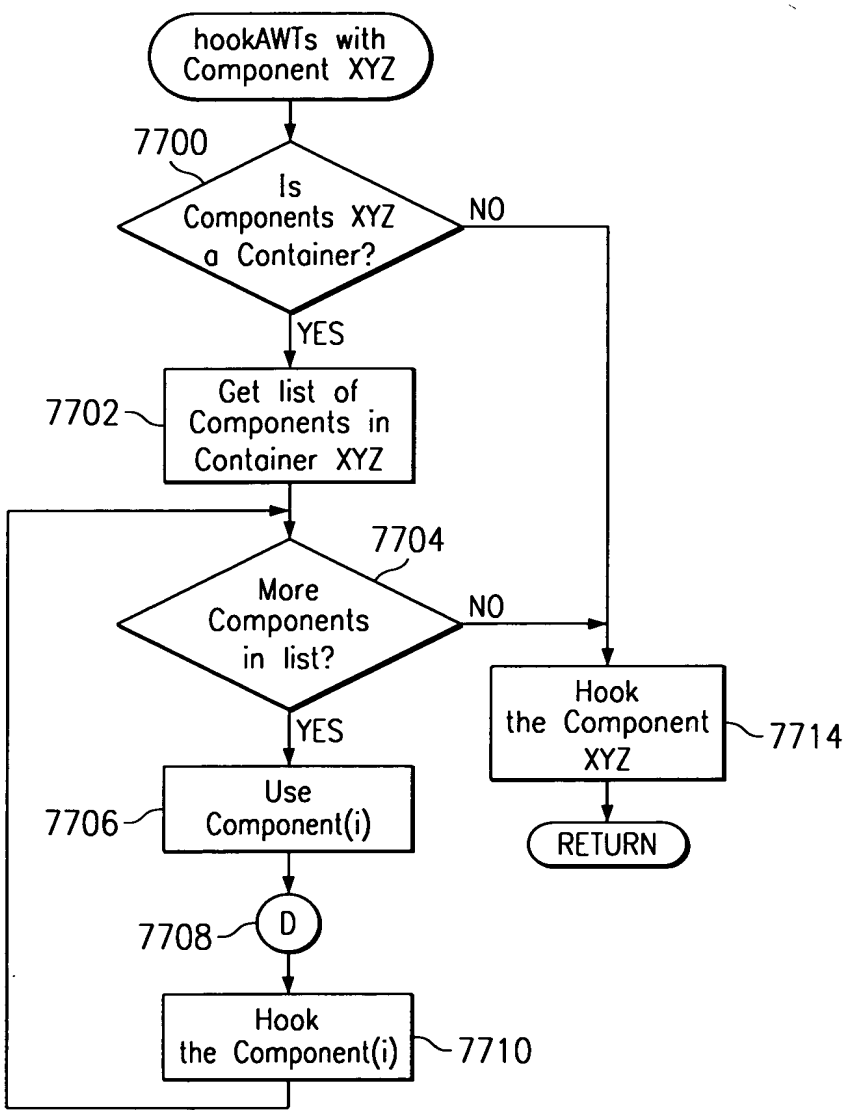

hookAWTs with Component XYZ
7700
Is Components XYZ a Container?
NO
YES
7702
Get list of Components in Container XYZ
7704
More Components in list?
NO
YES
Hook the Component XYZ
7714
RETURN
7706
Use Component(i)
7708
D
Hook the Component(i)
7710

FIG. 77

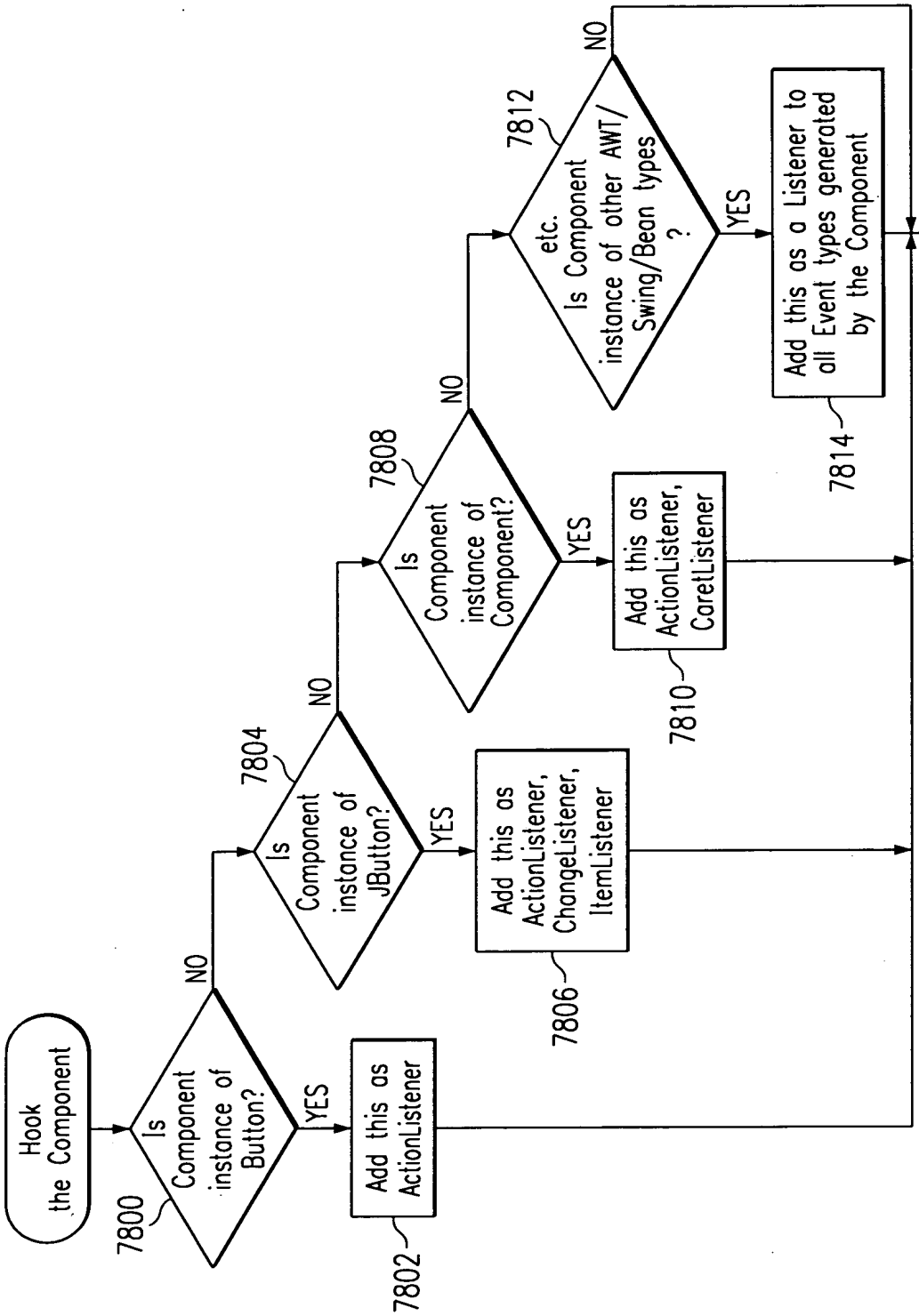

Hook the Component
Is Component instance of Button?
7800
YES
NO
Add this as ActionListener
7802
Is Component instance of JButton?
7804
YES
NO
Add this as ActionListener, ChangeListener, ItemListener
7806
Is Component instance of Component?
7808
YES
NO
Add this as ActionListener, CaretListener
7810
etc. Is Component instance of other AWT/ Swing/Bean types ?
7812
YES
NO
Add this as a Listener to all Event types generated by the Component
7814
RETURN

FIG. 78

Data Objects

✓ The ApplicationMediatorImpl will forward the refresh (default)

```
for each: ApplicationMediator -> refresh(data)
for each: ViewController -> refresh(data);
```

FIG. 79

✓ The ViewController will update the GUI

```
public void refresh(Object data) {
 //this example uses a keyValue pair data model

    if (data == null) return;
    else refresh((KeyValue) data);
}

public void refresh (KeyValue data) {
    nameField.setText(data.get("CustomerName"));
    idField.setText(data.get("CustomerId"));
    repaint(); //if necessary
}
```

FIG. 80

Data Objects

✓ How can we add a new data model (i.e. real objects)?

```
public void refresh(Object data) {
    if (data == null) return;
    else if (data instanceof Vector) {
        refresh((Vector) data);
    }
    else if (data instanceof KeyValue) {
            refresh((KeyValue) data);
        }
}
```

FIG. 81

```
public void refresh(Vector data) {
    //I know what they are
    Customer c = (Customer) data.elementAt(0);
    ID id = (ID) data.elementAt(1);
    nameField.setText(c.getName());
    idField.setText(id.toString());
    repaint(); //if necessary
}
```

FIG. 82

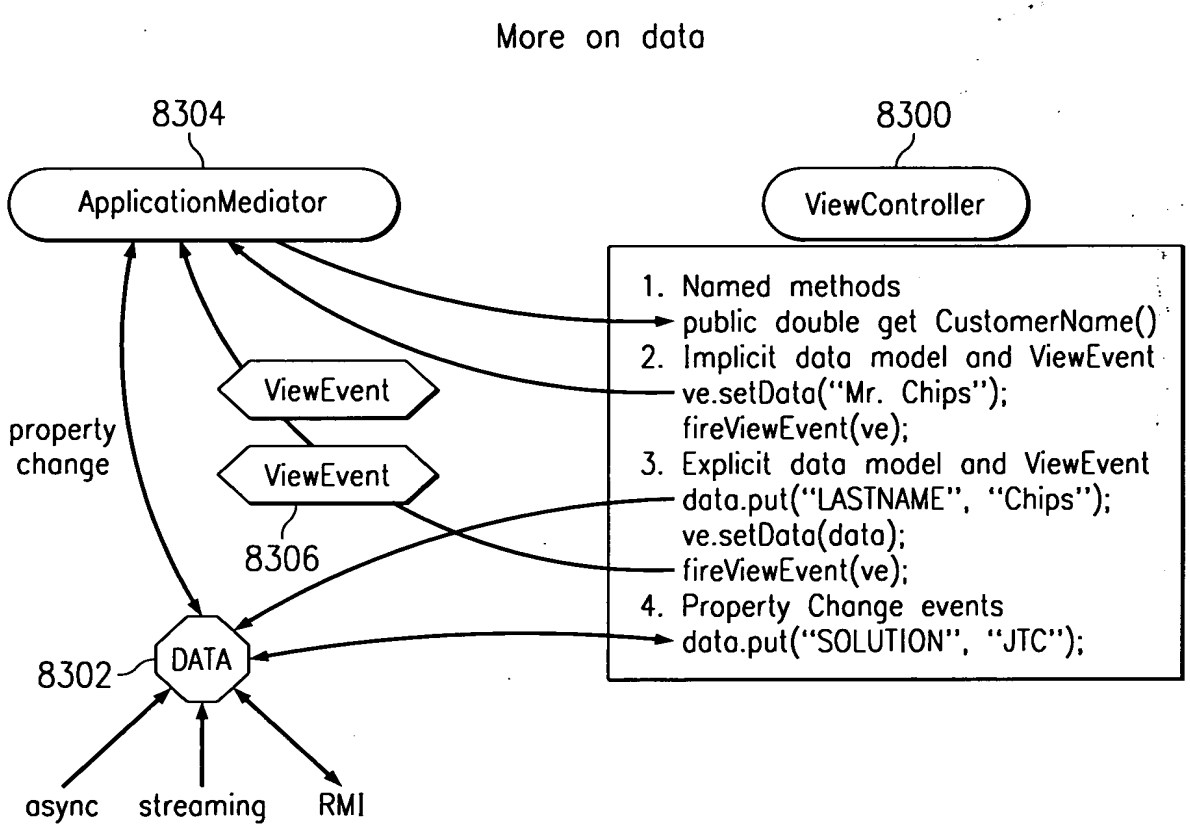

More on data
8304
8300
ApplicationMediator
ViewController
1. Named methods
public double get CustomerName()
2. Implicit data model and ViewEvent
ve.setData("Mr. Chips");
fireViewEvent(ve);
3. Explicit data model and ViewEvent
data.put("LASTNAME", "Chips");
ve.setData(data);
fireViewEvent(ve);
4. Property Change events
data.put("SOLUTION", "JTC");
ViewEvent
ViewEvent
property change
8306
8302
DATA
async
streaming
RMI

FIG. 83

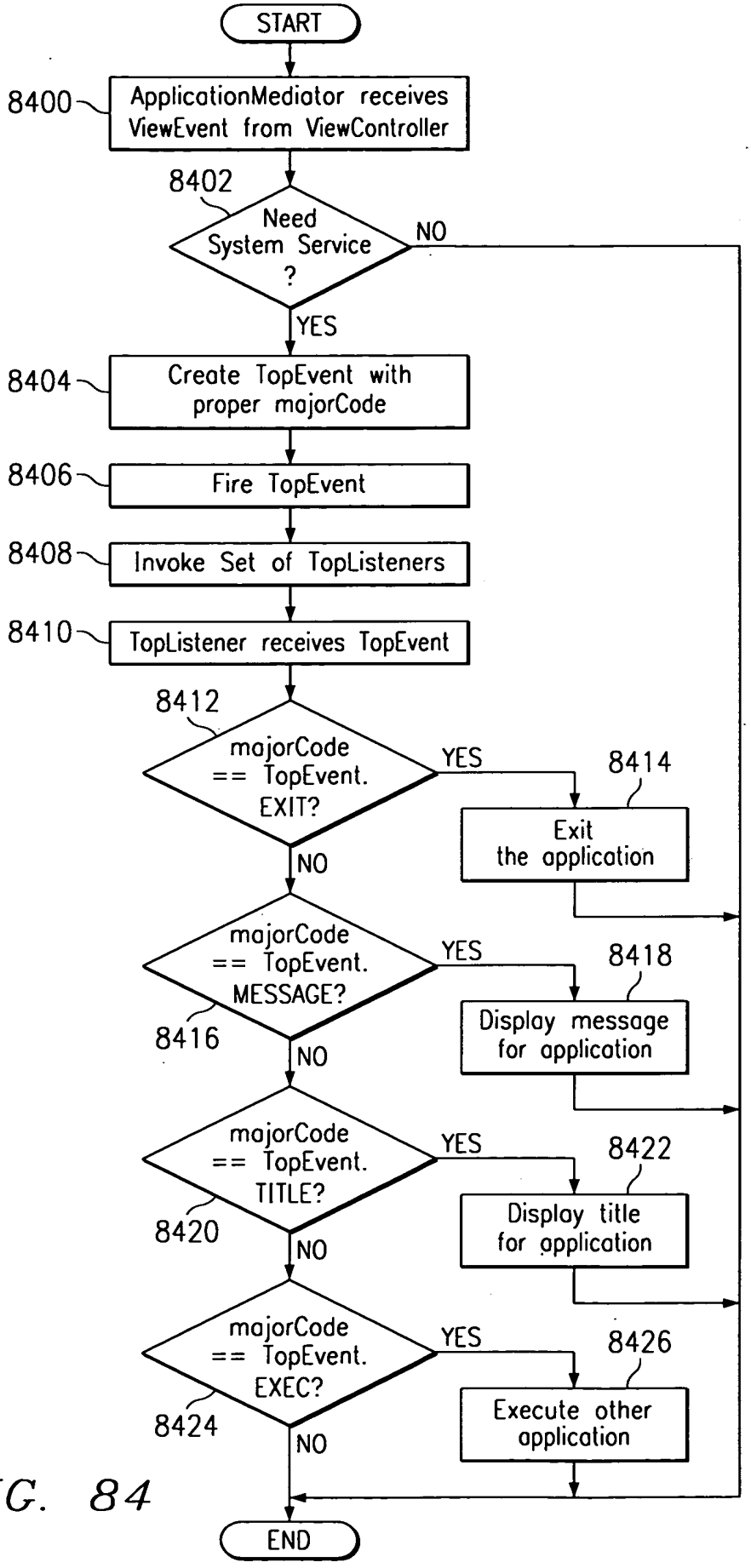

START
8400
ApplicationMediator receives ViewEvent from ViewController
8402
Need System Service ?
NO
YES
8404
Create TopEvent with proper majorCode
8406
Fire TopEvent
8408
Invoke Set of TopListeners
8410
TopListener receives TopEvent
8412
majorCode == TopEvent. EXIT?
YES
8414
Exit the application
NO
majorCode == TopEvent. MESSAGE?
YES
8418
Display message for application
8416
NO
majorCode == TopEvent. TITLE?
YES
8422
Display title for application
8420
NO
majorCode == TopEvent. EXEC?
YES
8426
Execute other application
8424
NO
END

FIG. 84

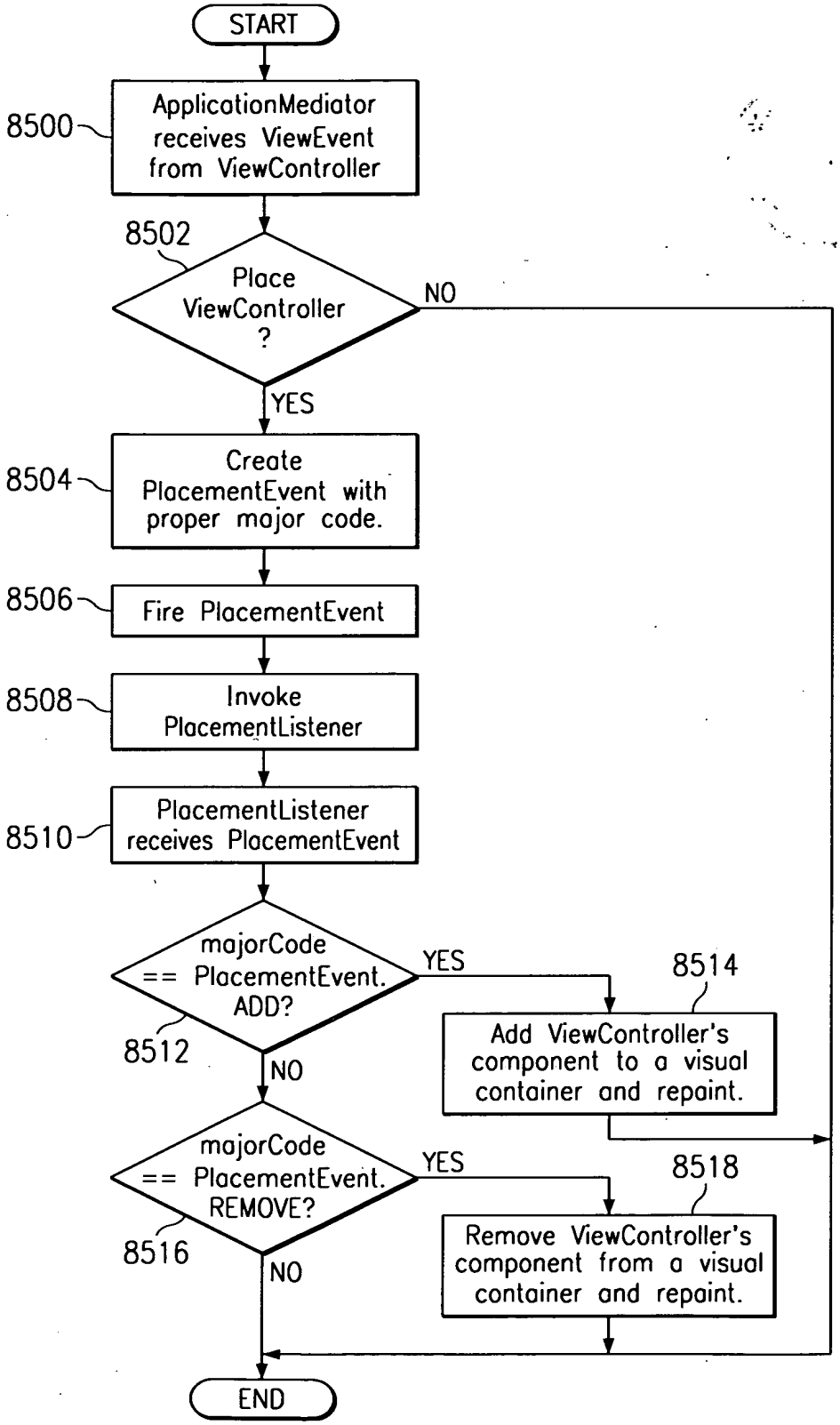

START
8500
ApplicationMediator receives ViewEvent from ViewController
8502
Place ViewController ?
NO
YES
8504
Create PlacementEvent with proper major code.
8506
Fire PlacementEvent
8508
Invoke PlacementListener
8510
PlacementListener receives PlacementEvent
majorCode == PlacementEvent. ADD?
8512
YES
8514
Add ViewController's component to a visual container and repaint.
NO
majorCode == PlacementEvent. REMOVE?
8516
YES
8518
Remove ViewController's component from a visual container and repaint.
NO
END

FIG. 85

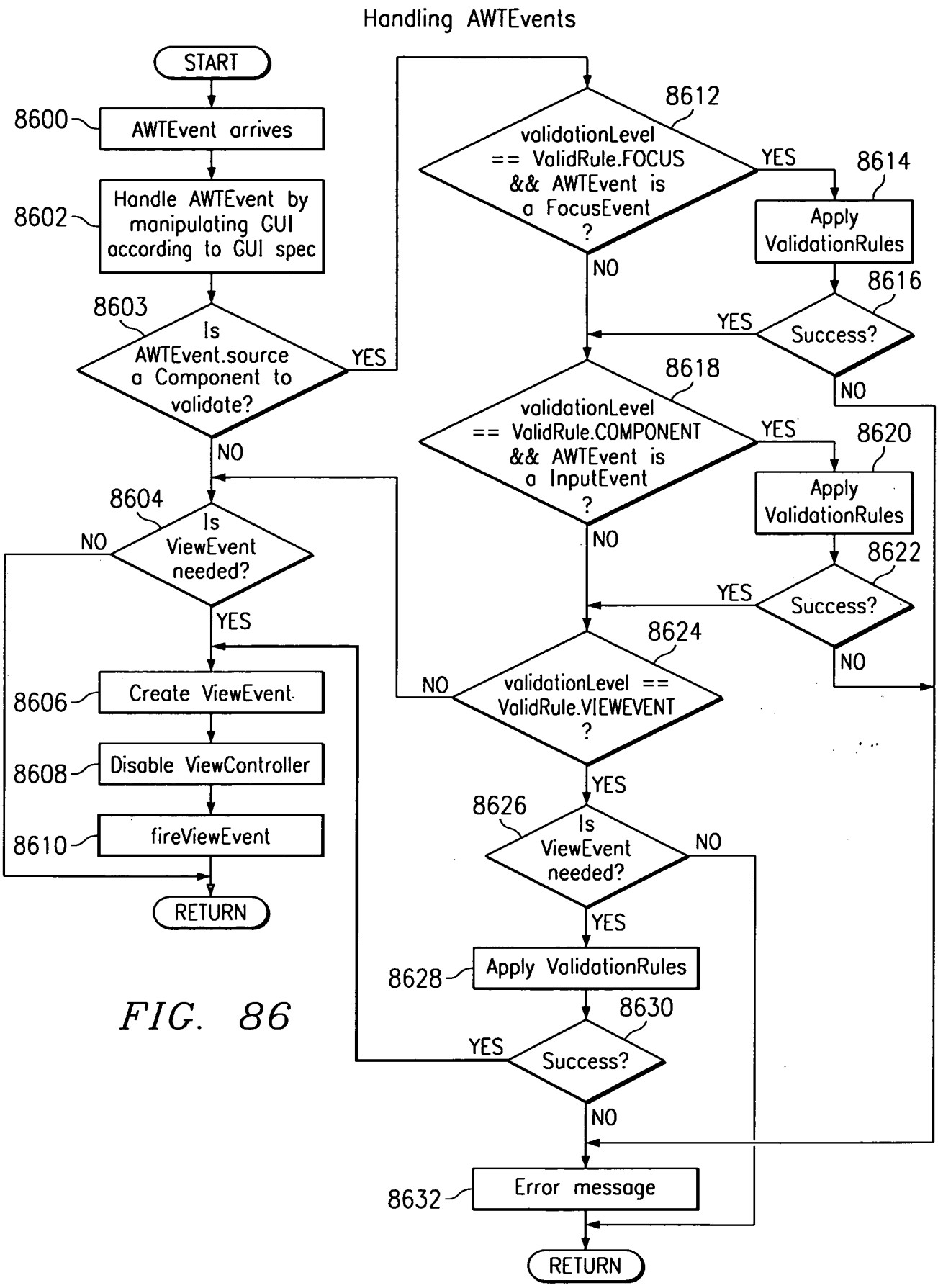

Handling AWTEvents
START
8600
AWTEvent arrives
8602
Handle AWTEvent by manipulating GUI according to GUI spec
8603
Is AWTEvent.source a Component to validate?
YES
NO
8604
Is ViewEvent needed?
NO
YES
8606
Create ViewEvent
8608
Disable ViewController
8610
fireViewEvent
RETURN
8612
validationLevel == ValidRule.FOCUS && AWTEvent is a FocusEvent ?
YES
8614
Apply ValidationRules
8616
Success?
YES
NO
NO
8618
validationLevel == ValidRule.COMPONENT && AWTEvent is a InputEvent ?
YES
8620
Apply ValidationRules
8622
Success?
YES
NO
NO
8624
validationLevel == ValidRule.VIEWEVENT ?
NO
YES
8626
Is ViewEvent needed?
NO
YES
8628
Apply ValidationRules
8630
Success?
YES
NO
8632
Error message
RETURN

FIG. 86

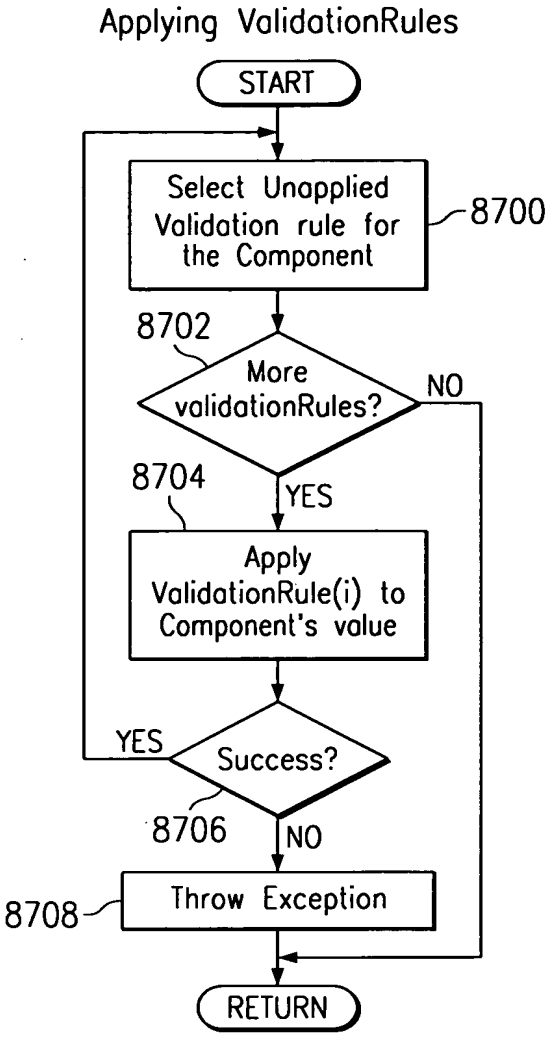


FIG. 87

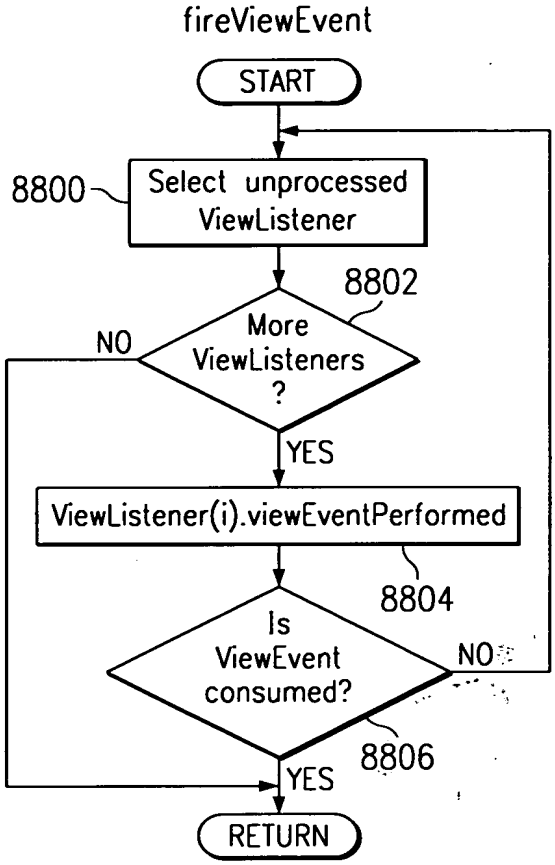


FIG. 88

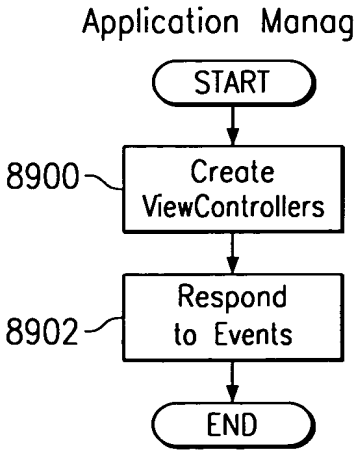


FIG. 89

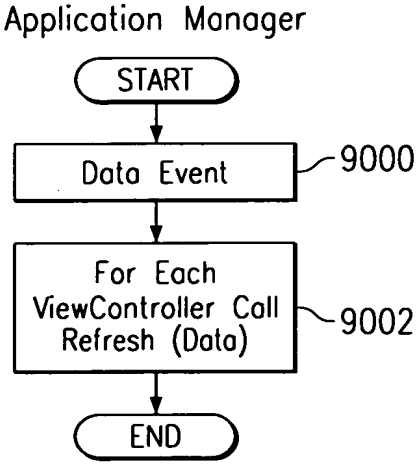


FIG. 90

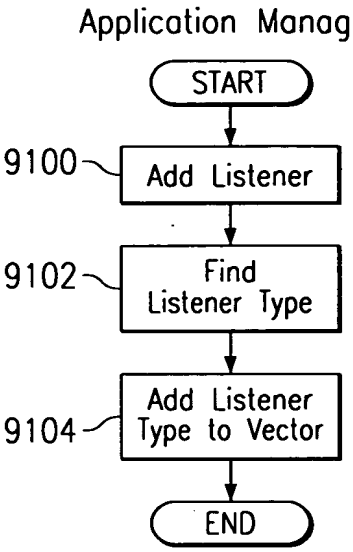


FIG. 91

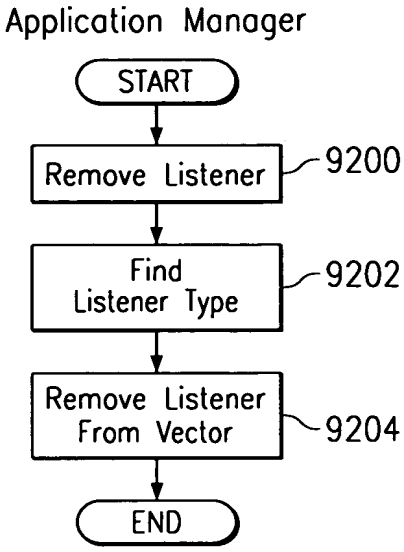


FIG. 92

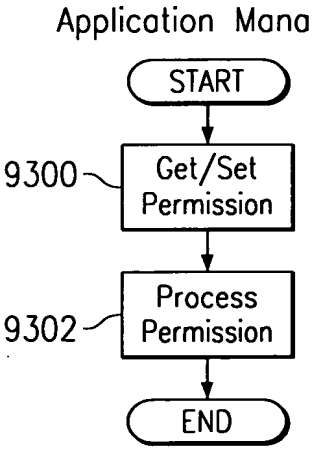


FIG. 93

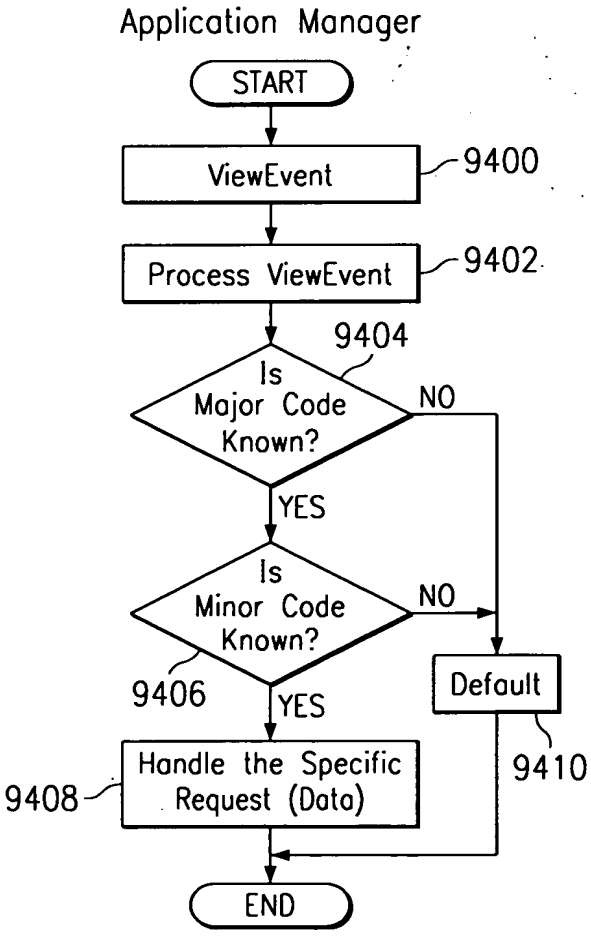


FIG. 94

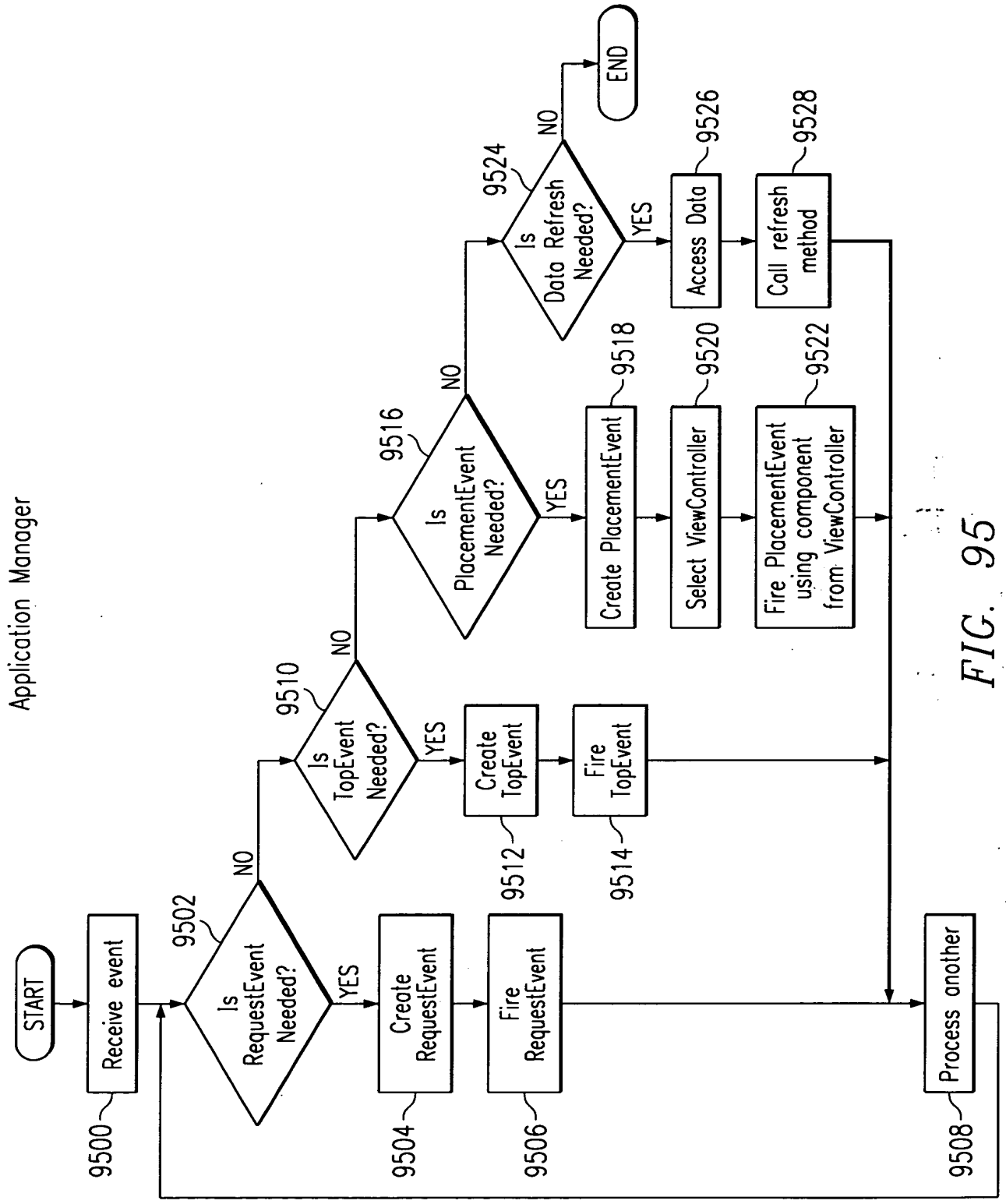

Application Manager
START
Receive event
9500
Is RequestEvent Needed?
9502
YES
NO
Create RequestEvent
9504
Fire RequestEvent
9506
Process another
9508
Is TopEvent Needed?
9510
YES
NO
Create TopEvent
9512
Fire TopEvent
9514
Is PlacementEvent Needed?
9516
YES
NO
Create PlacementEvent
9518
Select ViewController
9520
Fire PlacementEvent using component from ViewController
9522
Is Data Refresh Needed?
9524
YES
NO
Access Data
9526
Call refresh method
9528
END

FIG. 95

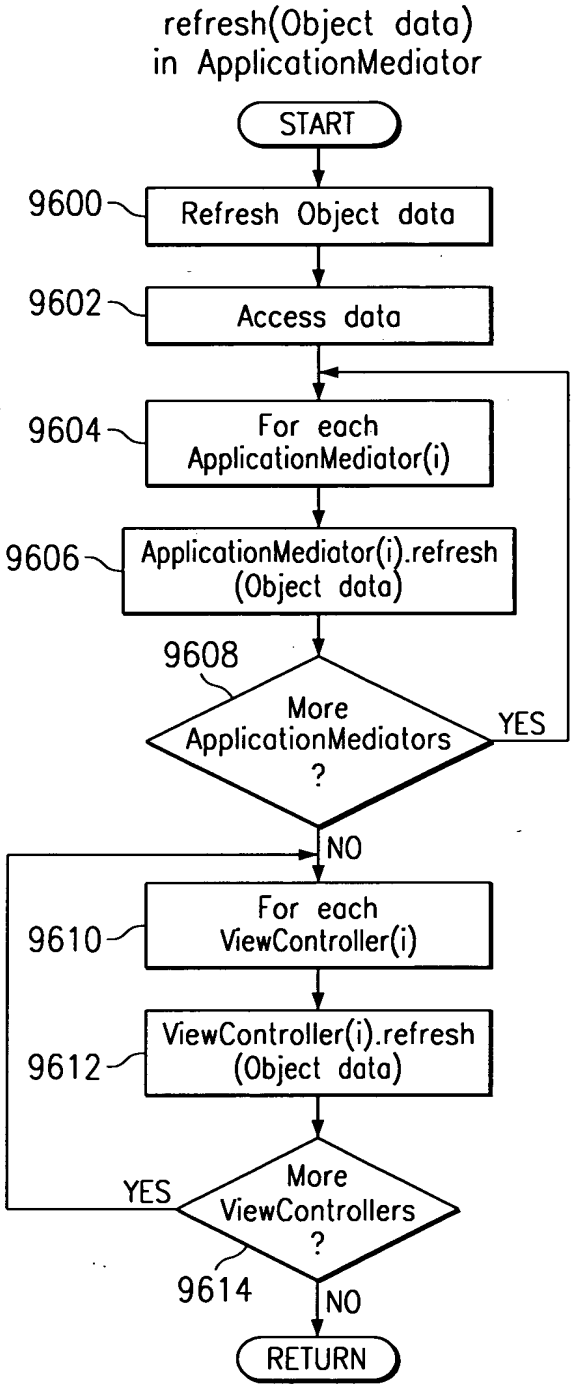

refresh(Object data)
in ApplicationMediator
START
9600
Refresh Object data
9602
Access data
9604
For each
ApplicationMediator(i)
9606
ApplicationMediator(i).refresh
(Object data)
9608
More
ApplicationMediators
?
YES
NO
9610
For each
ViewController(i)
9612
ViewController(i).refresh
(Object data)
More
ViewControllers
?
YES
9614
NO
RETURN

FIG. 96

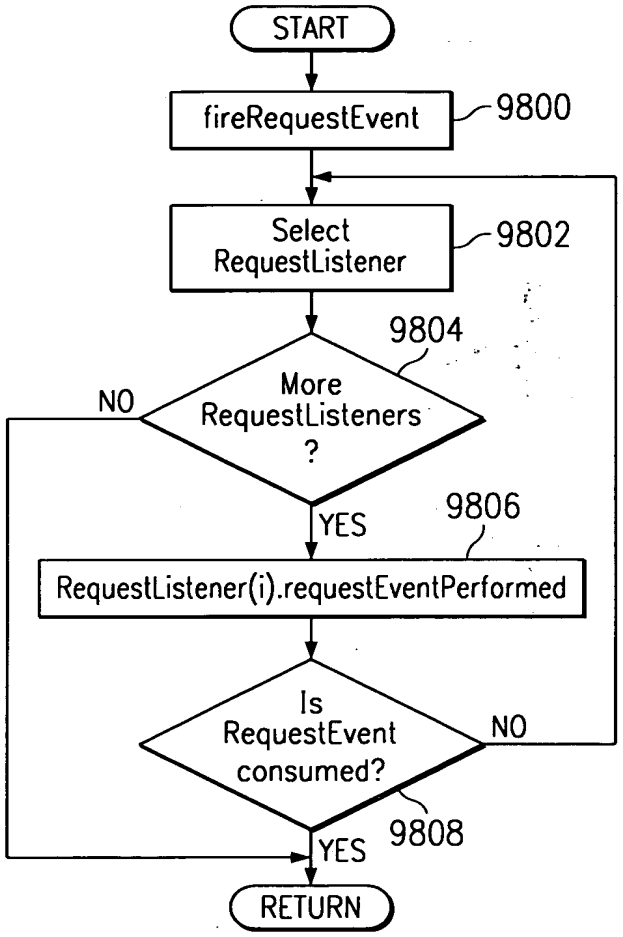

START
fireRequestEvent
9800
Select
RequestListener
9802
9804
More
RequestListeners
?
NO
YES
9806
RequestListener(i).requestEventPerformed
Is
RequestEvent
consumed?
NO
YES
9808
RETURN

FIG. 98

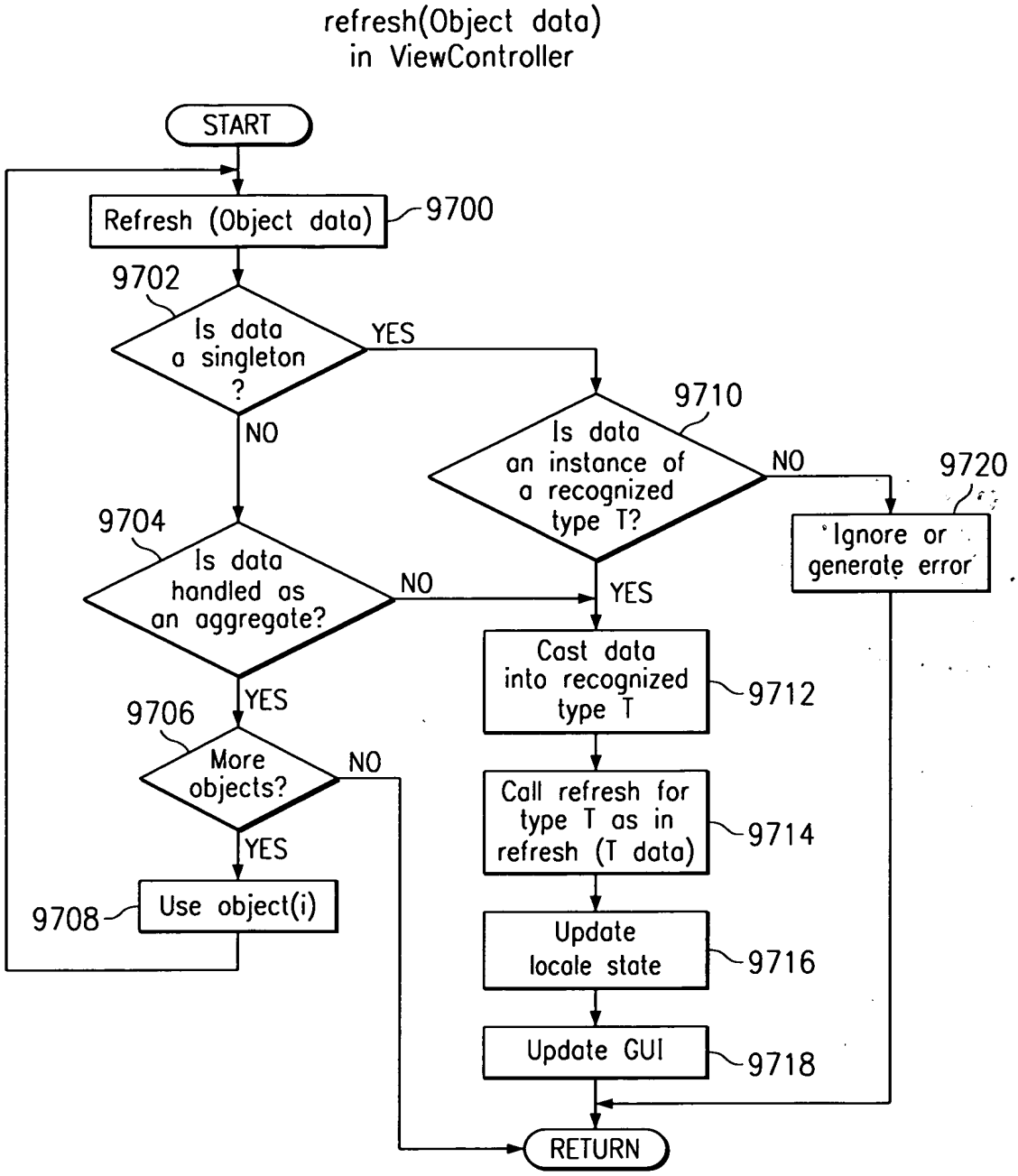

refresh(Object data)
in ViewController
START
Refresh (Object data)
9700
9702
Is data a singleton ?
YES
NO
9704
Is data handled as an aggregate?
NO
YES
9706
More objects?
NO
YES
9708
Use object(i)
9710
Is data an instance of a recognized type T?
NO
YES
9720
Ignore or generate error
Cast data into recognized type T
9712
Call refresh for type T as in refresh (T data)
9714
Update locale state
9716
Update GUI
9718
RETURN

FIG. 97

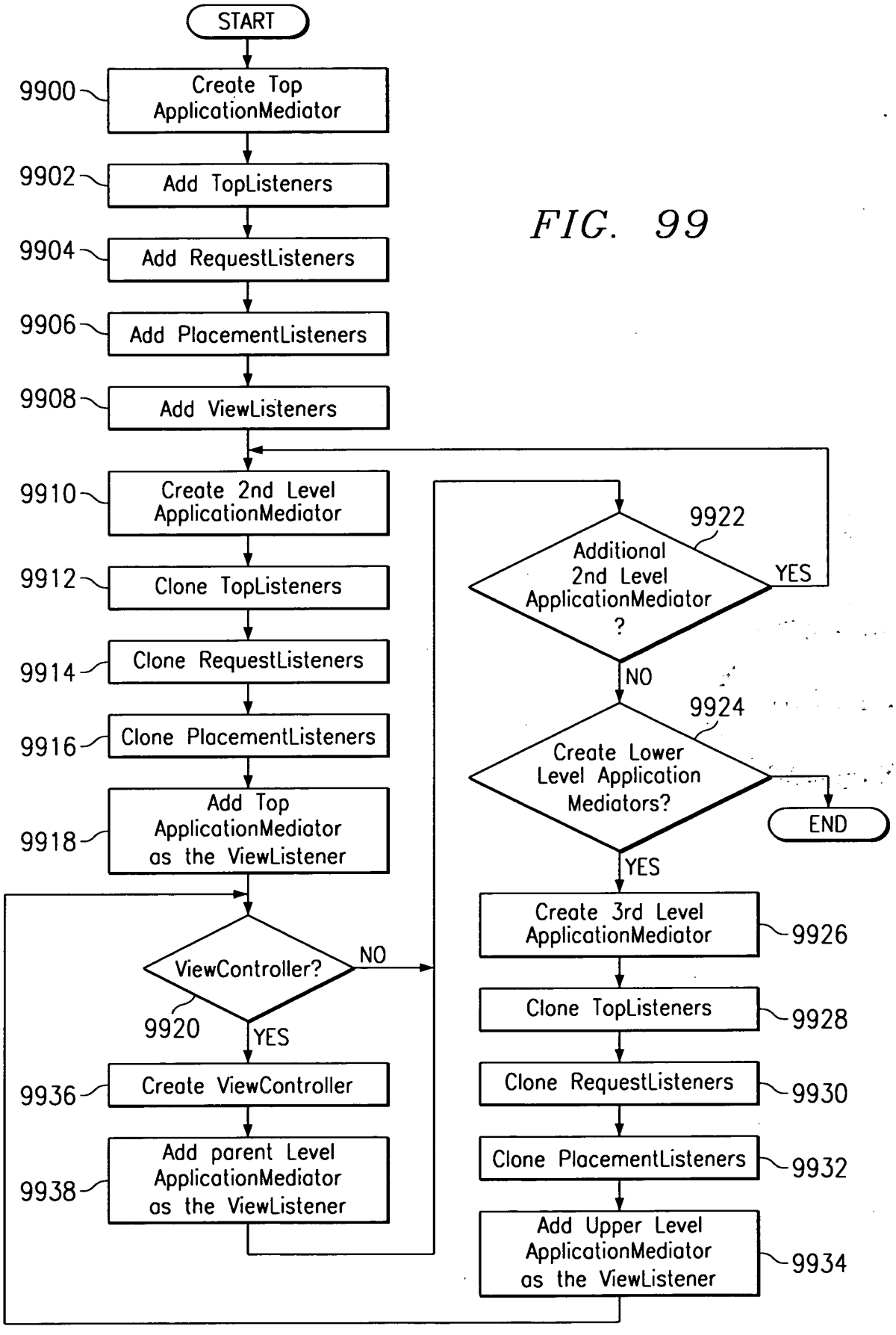

START
9900
Create Top ApplicationMediator
9902
Add TopListeners
9904
Add RequestListeners
9906
Add PlacementListeners
9908
Add ViewListeners
9910
Create 2nd Level ApplicationMediator
9912
Clone TopListeners
9914
Clone RequestListeners
9916
Clone PlacementListeners
9918
Add Top ApplicationMediator as the ViewListener
ViewController?
9920
NO
YES
9936
Create ViewController
9938
Add parent Level ApplicationMediator as the ViewListener
9922
Additional 2nd Level ApplicationMediator ?
YES
NO
9924
Create Lower Level Application Mediators?
END
YES
Create 3rd Level ApplicationMediator
9926
Clone TopListeners
9928
Clone RequestListeners
9930
Clone PlacementListeners
9932
Add Upper Level ApplicationMediator as the ViewListener
9934

FIG. 99

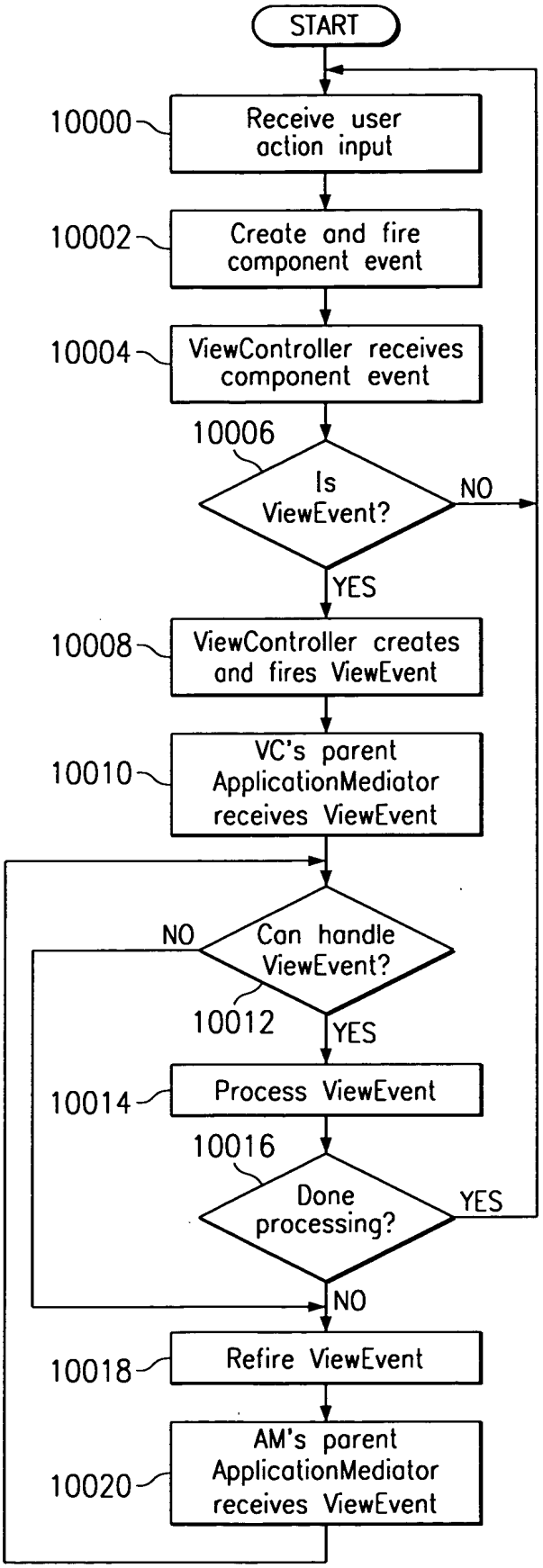


FIG. 100

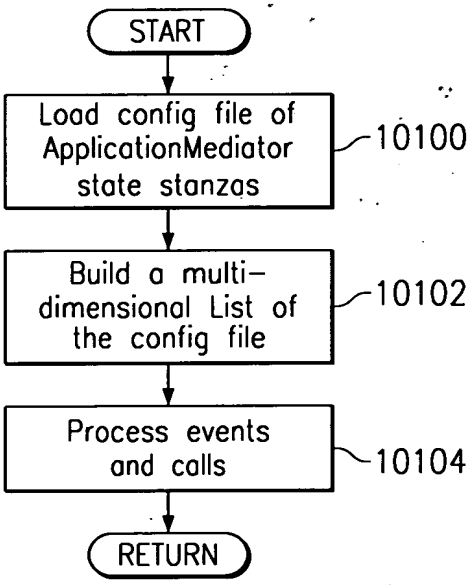


FIG. 101

Encoding ApplicationMediators

S1: (VE.source==vc1 && VE.major==A && VE.minor==B) =>
(RE.major=C RE.minor=D RE.data=VE.data RE.fireS)
if event source is vc1 with A,B as major/minor then
fire sync request with C,D major/minor and use data from event)

S2: VE.source==vc4 && VE.major==5) ==> (TE.major=3 TE.fire)
if event source is vc4 with 5 as major then
fire top event with major 3

S3: (Refresh) ==> (VC.i.refresh(Refresh.data))
if refresh(data) occurs, then refresh all view controllers with the same data, but not the other application mediators

S4: (VE.source==vcA) ==> (RE.major="set"RE.fireA) &&
(PE.major=PE.ADD PE.source=vcB PE.fire) && (VC.vcB.refresh(RE.data))
if event source is vcA, then fire async request, then fire placement event, then refresh the newly placed view controller with the data returned with the request

FIG. 102

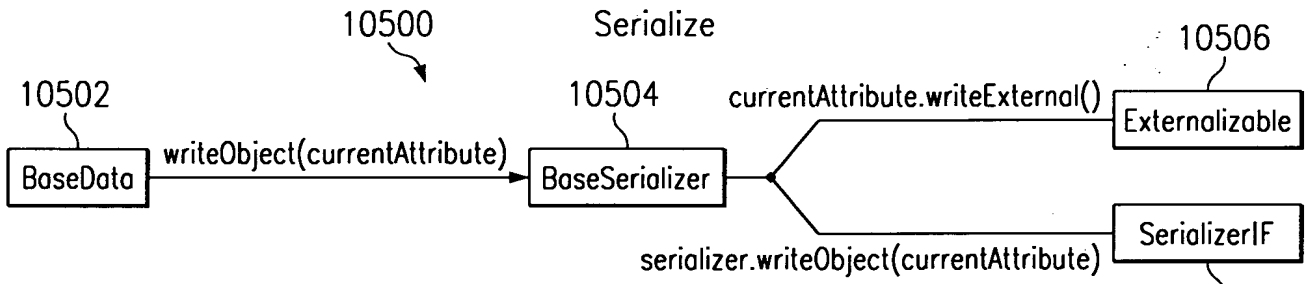


FIG. 105

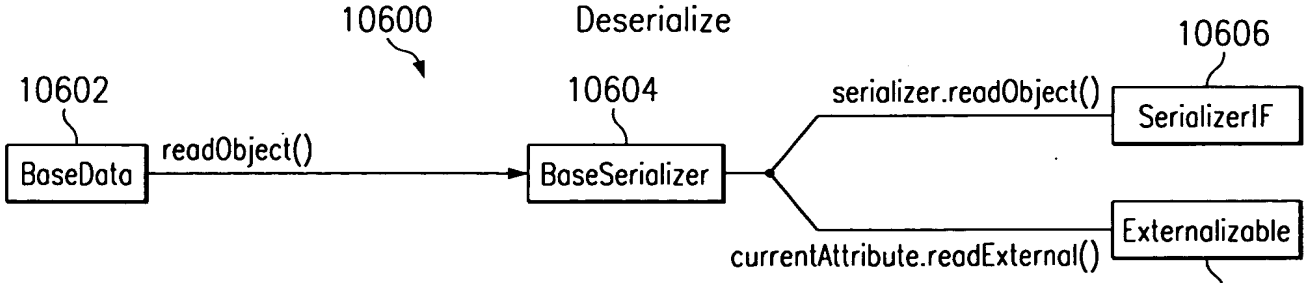


FIG. 106

Access State machine to see if processing is needed

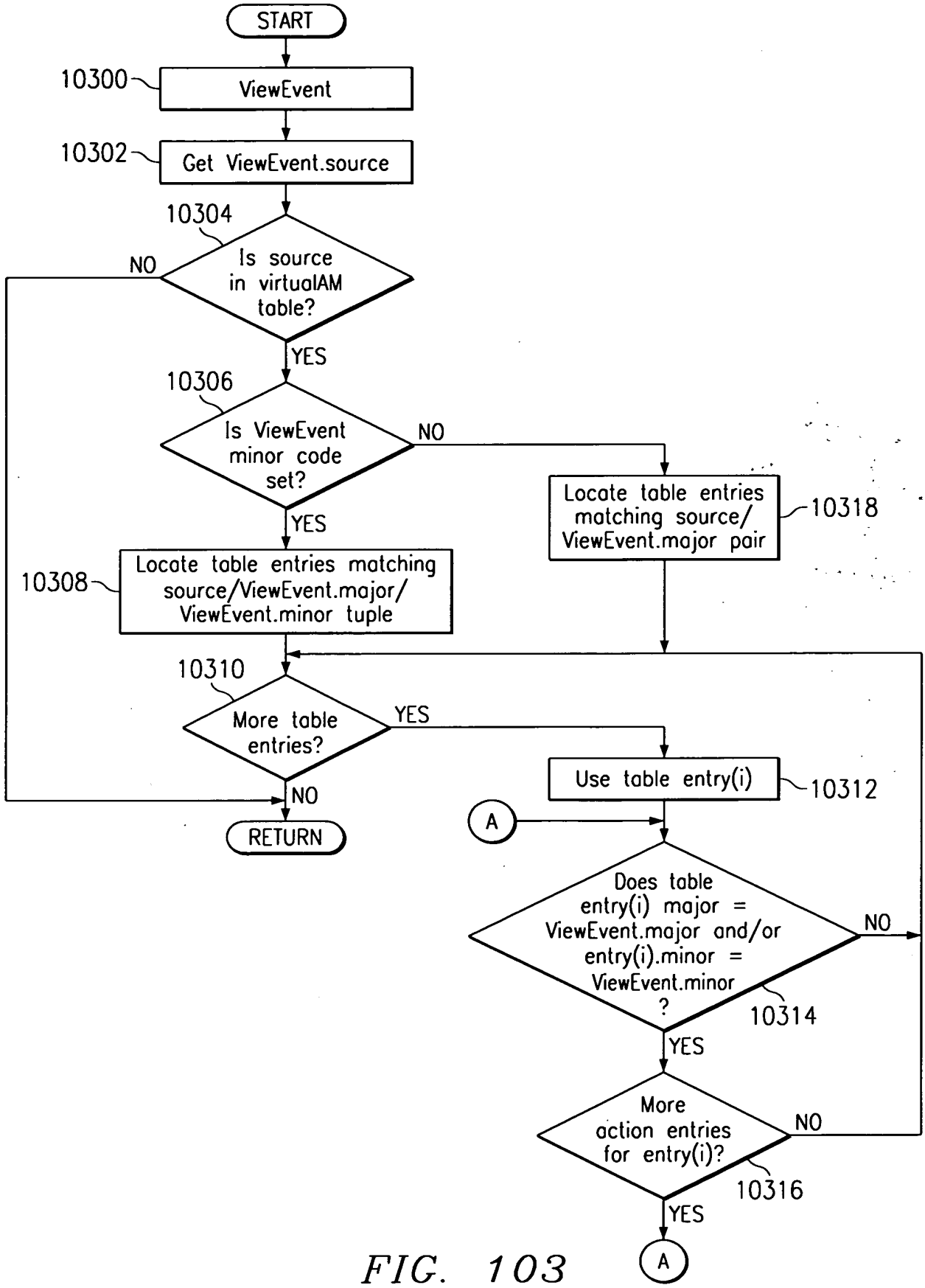


FIG. 103

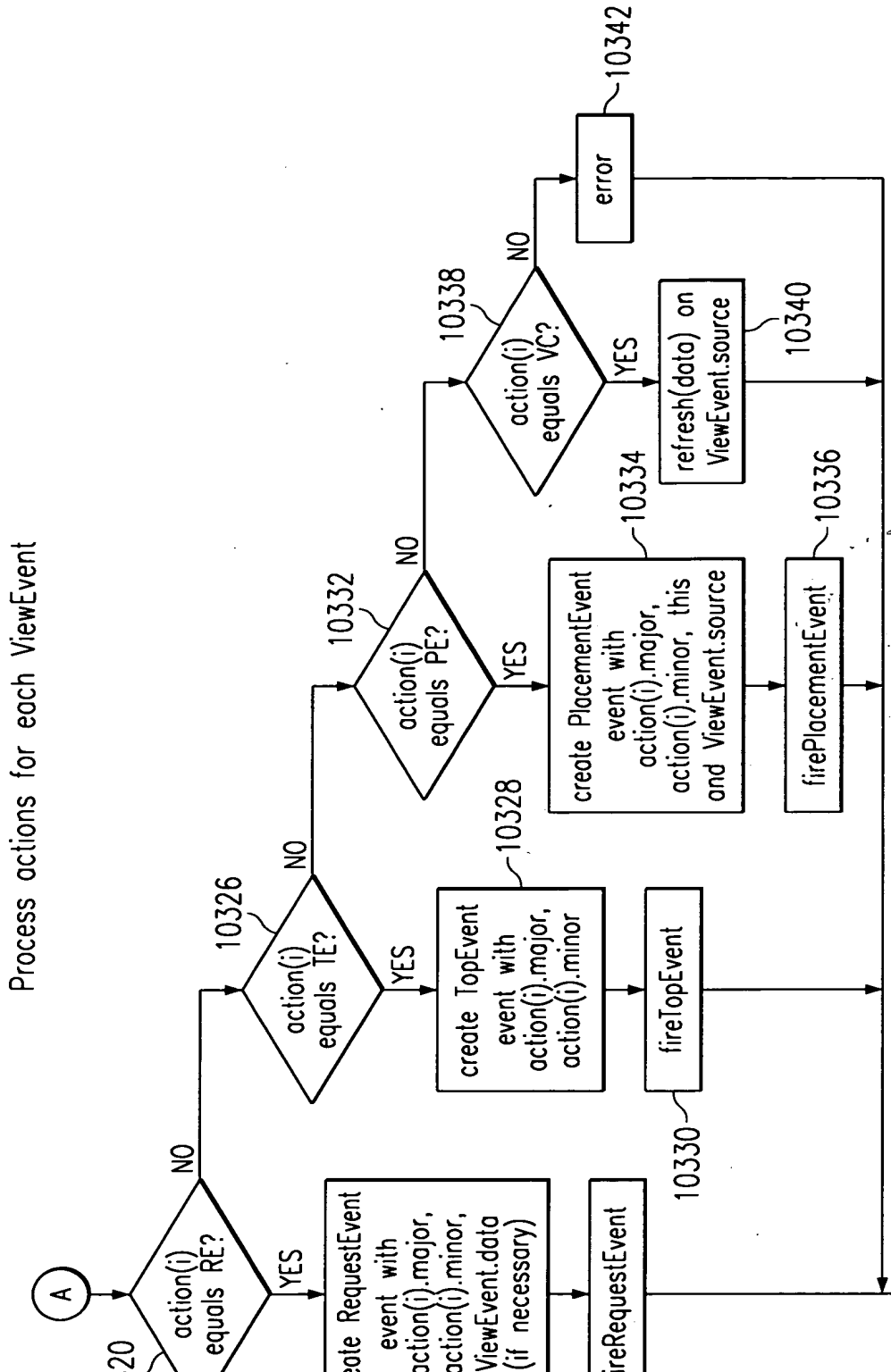

Process actions for each ViewEvent
A
10320
action(i) equals RE?
NO
YES
10322
create RequestEvent event with action(i).major, action(i).minor, ViewEvent.data (if necessary)
10324
fireRequestEvent
10326
action(i) equals TE?
NO
YES
10328
create TopEvent event with action(i).major, action(i).minor
10330
fireTopEvent
10332
action(i) equals PE?
NO
YES
10334
create PlacementEvent event with action(i).major, action(i).minor, this and ViewEvent.source
10336
firePlacementEvent
10338
action(i) equals VC?
NO
YES
10340
refresh(data) on ViewEvent.source
10342
error
RETURN

FIG. 104

10700

```
package com.ibm.jtcx.serialization;

import java.io.Externalizable;
import java.io.IOException;
import java.io.ObjectInput;
import java.io.ObjectOutput;
/**
 * Default type comment.
 *
 * <P>INVARIANT:
 */
public class BaseData implements Externalizable {
        private Object[] data = null;
/**
 * BaseData constructor comment.
 */
public BaseData() {
        this(0);
}
/**
 * BaseData constructor comment.
 * @param dataArray java.lang.Object[]
 */
public BaseData(int count) {
        super();

        setData(new Object[count]);
}
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @return java.lang.Object[]
 */
public final Object[], getData() {
        return data;
}
```

FIG. 107A

10700

```
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @return java.lang.Object
 * @param index int
 */
public final Object getData(int index) {
	Object retVal = null;

	if ((data != null) && (index < data.length)) {
		retVal = data[index];
	}

	return retVal;
}
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @param in ObjectInput
 */
public void readExternal(ObjectInput in)
	throws ClassNotFoundException, IOException {

	setData((Object[])in.readObject());
}
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @param dataArray java.lang.Object[]
 */
public final void setData(Object[] dataArray) {
	data = dataArray;
}
```

FIG. 107B

10700

```
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @param index int
 * @param dataElement java.lang.Object
 */
public final void setData(int index, object dataElement) {
        if ((data != null) && (index < data.length)) {
                data[index] = dataElement;
        }
}
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @param out ObjectOutput
 */
public void writeExternal(ObjectOutput out) throws IOException {
        out.writeObject(getData());
}
}
```

FIG. 107C

10800

```
package com.ibm.jtcx.serialization;

import java.io.Externalizable;
import java.io.IOException;
import java.io.ObjectInput;
import java.io.ObjectOutput;
import java.math.BigDecimal;
import java.math.BigInteger;
import java.util.Date;
import java.util.Enumeration;
import java.util.GregorianCalendar;
import java.util.Hashtable;
import java.util.SimpleTimeZone;
import java.util.TimeZone;
import java.util.Vector;
/**
 * Base class of data objects that require small serialization. The
 * attributes of the data object are stored in an array and the elements
 * of the array are written individually.
 *
 * <P>INVARIANT:
 */
public class BaseDataS extends BaseData implements Externalizable {
/**
 * Default constructor.
 */
public BaseDataS() {
        super();
}
/**
 * Creates a new <code>BaseDataS</code> object with a data array of
 * size <code>count</code>.
 *
 * @param count the size of the data array containing the attributes
 */
public BaseDataS(int count) {
        super(count);
```

FIG. 108A

```
}
/**
 * Reads the array of data elements from the stream. The responsibility
 * of reading the individual element is left to the
 * <code>BaseSerializer</code> via <code>readObject()<code>.
 *
 * @param in the input stream that contains the serialized object
 * @exception ClassNotFoundException thrown if
 * <code>BaseSerializer</code> fails to read the object from the stream
 * @exception IOException thrown if
 * <code>BaseSerializer</code> fails to read the object from the stream
 * @see BaseSerializer#readObject
 */
public void readExternal(ObjectInput in)
        throws ClassNotFoundException, IOException {

        int size = in.readShort();

        if (size == -1) {
                setData(null);
        } else {
                Object[] array = new Object[size];

                for (int i = 0; i < size; i++) {
                        array[i] = BaseSerializer.getInstance().readObject(in);
                }

                setData(array);
        }
}
/**
 * Writes the array of data elements. The responsibility of writing the
 * data elements is left to <code>BaseSerializer</code> via
 * <code>writeObject()</code>.
 *
 * @param out the output stream to which the data elements will be
 * written
 */
public void writeExternal(ObjectOutput out) throws IOException {
        Object[] array = getData();

        if (array == null) {
                out.writeShort(-1);
        } else {
                out.writeShort(array.length);

                for (int i = 0; i < array.length; i++) {
                        BaseSerializer.getInstance().writeObject(out, array[i]);
                }
        }
}
}
```

10800

FIG. 108B

10900

```
package com.ibm.jtcx.serialization;

import java.io.IOException;
import java.io.ObjectInput;
import java.io.ObjectOutput;
/**
 * The interface for those classes that serialize objects to and from
 * a stream. The object that implements this interface should write
 * just the object's attributes, not any other descriptive information
 * about the object. Typically, a <code>SerializerIF</code> knows how
 * to serialize a specific class.
 */
public interface SerializerIF {
/**
 * Reads an object from the stream.
 *
 * @return The object that was read.
 * @param in the input stream containing the object
 * @exception java.io.IOException thrown if the stream fails
 * @exception java.lang.ClassNotFoundException thrown if the stream
 * fails
 */
Object readObject(ObjectInput in) throws IOException, ClassNotFoundException;
/**
 * Writes the given object to the stream.
 *
 * @param out the output stream into which the object will be written
 * @param element the object that will be written to the stream
 * @exception java.io.IOException thrown if the stream fails
 */
void writeObject(ObjectOutput out, Object element) throws IOException;
}
```

FIG. 109

11000

```
package com.ibm.jtcx.serialization;

import java.io.*;
import java.math.BigInteger;
import java.math.BigDecimal;
import java.util.Date;
import java.util.GregorianCalendar;
import java.util.Hashtable;
import java.util.SimpleTimeZone;
import java.util.StringTokenizer;
import java.util.TimeZone;
import java.util.Vector;

/**
 * The <code>SerializerIF</code> that is used as the base level
 * serializer. It contains three tables used to serialize objects:
 * <br><ul>
 *          <li> codeTable: the table containing the serialization code of
 *                an object based on the name of the class
 *          <li> nameTable: the table containing the name of the class
 *                based on the serialization code
 *          <li> serializationTable: the table containing the serializer of
 *                an object based on its serialization code
 * </ul>
 * <br><br>
 * <code>BaseSerializer</code> delegates the responsibility of
 * serializing the objects to the <code>SerializerIF</code> associated
 * with that class or to the object itself if it implements
 * <code>Externalizable</code>.
 */
public class BaseSerializer implements SerializerIF {
      static private final int NULL_OBJECT = 0;
      static private final int OTHER = 0x00ff;

      static private final String HASHTABLE_SER = "ClassNameHash.ser";
      static private final String INI_FILE = "ClassNames.ini";

      static private Hashtable codeTable = null;
      static private Hashtable nameTable = null;
      static private Hashtable serializerTable = null;
      static private BaseSerializer instance = null;

      class BigDecimalSerializer implements Serializer IF {
            public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
```

FIG. 110A

11000

```
                int scale = in.readShort();
                int size = in.readShort();
                byte[] bytes = new byte[size];
                in.readFully(bytes);

                BigInteger temp = new BigInteger(bytes);
                return new BigDecimal(temp, scale);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                BigDecimal bigD = (BigDecimal)element;

                int scale = bigD.scale();
                bigD.setScale(0);
                byte[] bytes = bigD.toBigInteger().toByteArray();
                bigD.setScale(scale);

                out.writeShort(scale);
                out.writeShort(bytes.length);
                out.write(bytes);
        }
}
class BigIntegerSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException
{
                int size = in.readShort();
                byte[] bytes = new byte[size];
                in.readFully(bytes);

                return new BigInteger(bytes);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                byte[] bytes = ((BigInteger)element).toByteArray();

                out.writeShort(bytes.length);
                out.write(bytes);
        }
}
class BooleanSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException
{
                int value = in.readByte();

                return (value == 1) ? Boolean.TRUE: Boolean.FALSE;
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeByte(((Boolean)element).booleanValue() ? 1 : 0);
        }
}
```

FIG. 110B

11000

```
class ByteSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
                byte value = in.readByte();

                return new Byte(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeByte(((Byte)element).byteValue());
        }
}
class CharacterSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
                char value = in.readChar();

                return new Character(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeChar(((Character)element).charValue());
        }
}
class DateSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException IOException {
                long value = in.readLong();

                return new Date(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeLong(((Date)element).getTime());
        }
}
class DoubleSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
                double value = in.readDouble();

                return new Double(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeDouble(((Double)element).doubleValue());
        }
}
```

FIG. 110C

11000

```
class FloatSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
                float value = in.readFloat();

                return new Float(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeFloat(((Float)element).floatValue());
        }
}
class GregorianCalendarSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
                long time = in.readLong();
                Date date = new Date(time);
                SerializerIF serializer = BaseSerializer.getInstance();
                TimeZone tz = (TimeZone)serializer.readObject(in);

                GregorianCalender gCalender = new GregorianCalendar(tz);
                gCalendar.setTime(date);

                return gCalendar;
}
public void writeObject(ObjectOutput out, Object element) throws IOException {
                GregorianCalendar temp = (GregorianCalendar)element;

                Date date = temp.getTime();
                TimeZone tz = temp.getTimeZone();

                out.writeLong(date.getTime());
                SerializerIF serializer = BaseSerializer.getInstance();
                serializer.writeObject(out, tz);
        }
}
class IntegerSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
                int value = in.readInt();

                return new Integer(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                out.writeInt(((Integer)element).intValue());
        }
}
class LongSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
```

FIG. 110D

11000

```
            long value = in.readLong();

            return new Long(value);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
            out.writeLong(((Long)element).longValue());
        }
}
class ObjectArraySerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
            int size = in.readShort();

            Object[] array = new Object[size];
            for (int i = 0; i < size; i++) {
                SerializerIF serializer = BaseSerializer.getInstance();
                array[i] = serializer.readObject(in);
            }

            return array;
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
            Object[] array = (Object[])element;

            out.writeShort(array.length);
            for (int i = 0; i < array length, i++) {
                SerializerIF serializer = BaseSerializer.getInstance();
                serializer.writeObject(out, array[i];
            }
        }
}
class ObjectSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
            return in.readObject();
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
            out.writeObject(element);
        }
}
class ShortSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
            short value = in.readShort();

            return new Short(value);
        }
```

FIG. 110E

11000

```
        public void writeObject(ObjectOutput out, Object element) throws IOException {
            out.writeShort(((Short)element).shortValue());
        }
}
class SimpleTimeZoneSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
            int offset = in.readInt();
            SerializerIF serializer = BaseSerializer.getInstance();
            String id = (String)serializer.readObject(in);

            return new SimpleTimeZone(offset, id);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
            SimpleTimeZone temp = (SimpleTimeZone)element;

            out.writeInt(temp.getRawOffset());
            SerializerIF serializer = BaseSerializer.getInstance();
            serializer.writeObject(out, temp.getID());
        }
}
class StringSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
            int size = in.readShort();
            byte[] bytes = new byte[size];
            in.readFully(bytes);

            return new String(bytes);
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
            byte[] bytes = ((String)element).getBytes();

            out.writeShort(bytes.length);
            out.write(bytes);
        }
}
class VectorSerializer implements SerializerIF {
        public Object readObject(ObjectInput in) throws ClassNotFoundException, IOException {
            int size = in.readShort();

            Vector vector = new Vector(size);
            for (int i = 0; i < size; i++) {
                    SerializerIF serializer = BaseSerializer.getInstance();
                    vector.addElement(serializer.readObject(in));
            }
```

FIG. 110F

11000

```
                return vector;
        }
        public void writeObject(ObjectOutput out, Object element) throws IOException {
                Vector temp = (Vector)element;

                Object[] array = new Object[temp.size()];
                for (int i = 0; i < array.length; i++) {
                        array[i] = temp.elementAt(i);
                }

                out.writeShort(array.length);
                for (int i = 0; i < array.length; i++) {
                        SerializerIF serializer=BaseSerializer.getInstance();
                        serializer.writeObject(out, array[i]);
                }
        }
    }
/**
 * Default constructor. The constructor is private because this is a
 * singleton class. When the object is constructed, it initializes its
 * tables.
 */
private BaseSerializer() {
    init();
}
/**
 * Adds the given elements to the three tables.
 *
 * @param className the name of the class
 * @param code the code for the given class
 * @param serializer the object responsible for serializing the given
 * class
 */
private void addDataToTables(String className, Number code, SerializerIF serializer) {
    getCodeTable().put(code, className);
    getNameTable().put(className, code);

    if (serializer != null) {
        getSerializerTable().put(code, serializer);
    }
}
```

FIG. 110G

11000

```
/**
 * Creates the codes and serializer objects for the default serialization
 * classes and adds them to the tables. The tables are then written to
 * a serialized file.
 */
private void createDefaultTables() {
      addDataToTables(BigDecimal.class.getName(), new Byte((byte)1), new
BigDecimalSerializer());
      addDataToTables(BigInteger.class.getName(), new Byte((byte)2), new BigIntegerSerializer());
      addDataToTables(Boolean.class.getName(), new Byte((byte)3), new BooleanSerializer());
      addDataToTables(Byte.class.getName(), new Byte((byte)4), new ByteSerializer());
      addDataToTables(Character.class.getName(), new Byte((byte)5), new CharacterSerializer());
      addDataToTables(Date.class.getName(), new Byte((byte)6), new DateSerializer());
      addDataToTables(Double.class.getName(), new Byte((byte)7), new DoubleSerializer());
      addDataToTables(Float.class.getName(), new Byte((byte)8), new FloatSerializer());
      addDataToTables(GregorianCalendar.class.getName(), new Byte((byte)9), new
GregorianCalendarSerializer();
      addDataToTables(Integer.class.getName(), new Byte((byte)10), new IntegerSerializer());
      addDataToTables(Long.class.getName(), new Byte((byte)11), new LongSerializer());
      addDataToTables(Short.class.getName(), new Byte((byte)12), new ShortSerializer());
      addDataToTables(SimpleTimeZone.class.getName(), new Byte((byte)13), new
SimpleTimeZoneSerializer());
      addDataToTables(String.class.getName(), new Byte((byte)14), new StringSerializer());
      addDataToTables(Vector.class.getName(), new Byte((byte)15), new VectorSerializer());
      addDataToTables(Object.class.getName(), new Byte((byte)16), new ObjectSerializer());

      writeTables();
}
/**
 * Returns an instance of the table of class names, keyed by their code.
 * If the table does not exist, it is created.
 *
 * @return The table of class names.
 */
protected Hashtable getCodeTable() {
      if (codeTable == null) {
            codeTable = new Hashtable();
      }
```

FIG. 110H

11000

```
        return codeTable;
}
/**
* Returns an instance of <code>BaseSerializer</code>.
*
* @return An instance of <code>BaseSerializer</code>.
*/
public static SerializerIF getInstance() {
        if (instance == null) {
                instance = new BaseSerializer();
        }

        return instance;
}
/**
* Returns an instance of the table of codes, keyed by their
* corresponding class name.
* If the table does not exist, it is created.
*
* @return The table of codes.
*/
protected Hashtable getNameTable() {
        if (nameTable == null) {
                nameTable = new Hashtable();
        }

        return nameTable;
}
/**
* Returns an instance of the table of serializers, keyed by their
* corresponding code.
* If the table does not exist, it is created.
*
* @ return The table of class names.
*/
protected Hashtable getSerializerTable() {
        if (serializerTable == null) {
                serializerTable = new Hashtable();
        }

        return serializerTable;
}
/**
* Initializes the hashtable from either a serialized hashtable or from
* an ini file.
*/
```

FIG. 110I

11000

```
protected void init() {
        File serializedFile = new File(HASHTABLE_SER);
        File iniFile = new File(INI_FILE);

        if (serializedFile.exists()) {
                readSerializedFile(serializedFile);
        } else {
                if (iniFile.exists()) {
                        readIniFile(iniFile);
                }

                createDefaultTables();
        }
}
/**
 * Gets the value of the serialization code from the table based on
 * the className provided. The value returned can either be a
 * <code>Byte</code> or an <code>Integer</code>. The return value
 * will be a <code>Byte</code> if the className is one of the base
 * data types.
 *
 * @return The serialization code of the className.
 * @param className the name of the class
 */
private Number lookupCode(String className) {
        Number code = null;

        if (className != null) {
                code = (Number)getNameTable().get(className);
        }

        return code;
}
/**
 * Looks up the hashcode in the table and returns the String value of
 * the hashcode. If the hashcode does not exist in the table
 * <code>null</code> is returned.
 *
 * @return The object that was stored in the table with the given
 *                hashcode.
 * @param hashcode the hashcode that will be used to look up the value
 */
```

FIG. 110J

11000

```
private String lookupName(Number code) {
        String className = null;

        if (code != null) {
                className = (String)getCodeTable().get(code);
        }

        return className;
}
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @return com.ibm.jtc.util.SerializerIF
 * @param code int
 */
private SerializerIF lookupSerializer(Number code) {
        SerializerIF serializer = null;

        if (code != null) {
                serializer = (SerializerIF)getSerializerTable().get(code);
        }

        return serializer;
}
/**
 * Default method comment.
 *
 * <P>PRE:
 * <P>POST:
 *
 * @return Parameter not modified
 * @param iniFile java.io.File
 */
private void readIniFile(File iniFile) {
        BufferedReader in = null;

        try {
                in = new BufferedReader(new FileReader(iniFile));

                for (String inLine = in.readLine(); inLine != null; inLine = in.readLine()) {
                        String trimLine = inLine.trim();
```

FIG. 110K

11000

```
                if ((trimLine.length() > 0) &&
                        !trimLine.startsWith("#")) {
                        StringTokenizer tokenizer = new StringTokenizer(trimLine);

                        String className = tokenizer.nextToken();
                        Integer code = new Integer(className.hashCode());
                        SerializerIF serializer = null;

                        if (tokenizer.hasMoreTokens()) {
                            String serializerName = tokenizer.nextToken();

                            try {
                                serializer = (SerializerIF)Class.forName(serializerName).newInstance();
                            } catch(Exception e) { }
                        }

                        addDataToTables(className, code, serializer);
                }
            }
        } catch (Exception throwAway) {
        } finally {
            try {
                in.close();
            } catch (Exception throwAway) {
            }
        }

        writeTables();
    }
    /**
    * Reads the object from the stream by first reading the code for the
    * element then reads the appropriate data for that object.
    *
    * @return The object that was read from the stream.
    * @param in the input stream that contains the object
    */
    public Object readObject(ObjectInput in)
        throws ClassNotFoundException, IOException {
        Object retVal = null;
        Number code = null;

        byte baseCode = in.readByte();
```

FIG. 110L

11000

```
        if (baseCode == NULL_OBJECT) {
                retVal = null;
        } else {
                if (baseCode != OTHER) {
                        code = new Byte(baseCode);
                } else {
                        int secondCode = in.readInt();
                        code = new Integer(secondCode);
                }

                SerializerIF serializer = lookupSerializer(code);
                if (serializer != null) {
                        retVal = serializer.readObject(in);
                } else {
                        String className = lookupName(code);

                        try {
                                retVal = Class.forName(className).newInstance();

                                if (retVal instanceof Externalizable) {
                                        ((Externalizable)retVal).readExternal(in);
                                } else {
                                        retVal = in.readObject();
                                }
                        } catch(Exception e) {
                        }
                }
        }

        return retVal;
}
/**
 * Reads the file containing the serialized hashtables of data.
 *
 * @param serializedFile the file containing the serialized tables
 */
private void readSerializedFile(File serializedFile) {
        ObjectInputStream in = null;
        try {
                in = new ObjectInputStream(new FileInputStream(serializedFile));
                codeTable = (Hashtable)in.readObject();
                nameTable = (Hashtable)in.readObject();
                serializerTable = (Hashtable)in.readObject();
```

FIG. 110M

11000

```
        } catch (Exception throwAway) {
        } finally {
                try {
                        in.close();
                } catch (Exception throwAway) { }

                if ((codeTable == null) ||
                        (nameTable == null) ||
                        (serializerTable == null)) {

                        createDefaultTables();
                }
        }
}
/**
 * Writes the given object to the stream. First, the code representing
 * the type of the object is written, then the data within the object
 * is written.
 *
 * @param out the output stream that will contain the object
 * @param element the data object that will be written
 */
public void writeObject(ObjectOutput out, Object element)
        throws IOException {

        if (element == null) {
                out.writeByte(NULL_OBJECT);
        } else {
                String className = element.getClass().getName();
                Number code = lookupCode(className);

                if (code != null) {
                        if (code instanceof Byte) {
                                out.writeByte(code.byteValue());
                        } else if (code instanceof Integer) {
                                out.writeByte(OTHER);
                                out.writeInt(code.intValue());
                        }

                        SerializerIF serializer = lookupSerializer(code);

                        if (serializer != null) {
                                serializer.writeObject(out, element);
                        } else if (element instanceof Externalizable) {
                                ((Externalizable)element).writeExternal(out);
```

FIG. 110N

11000

```
                } else {
                        out.writeObject(element);
                }
        } else {
                if (element instanceof Object[]) {
                        className = Object[].class.getName();
                } else {
                        className = Object.class.getName();
                }

                code = lookupCode(className);
                SerializerIF serializer = lookupSerializer(code);

                out.writeByte(code.byteValue());
                serializer.writeObject(out, element);
        }
    }
}
/**
 * Writes the tables to the file.
 */
private void writeTables() {
    ObjectOutputStream out = null;

    try {
        File serFile = new File(HASHTABLE_SER);
        out = new ObjectOutputStream(new FileOutputStream(serFile));

        out.writeObject(getCodeTable());
        out.writeObject(getNameTable());
        out.writeObject(getSerializerTable());
        out.writeObject(new Date());
    } catch(Exception e) {
    } finally {
        try {
            out.close();
        } catch(Exception e) { }
    }
}
```

FIG. 1100

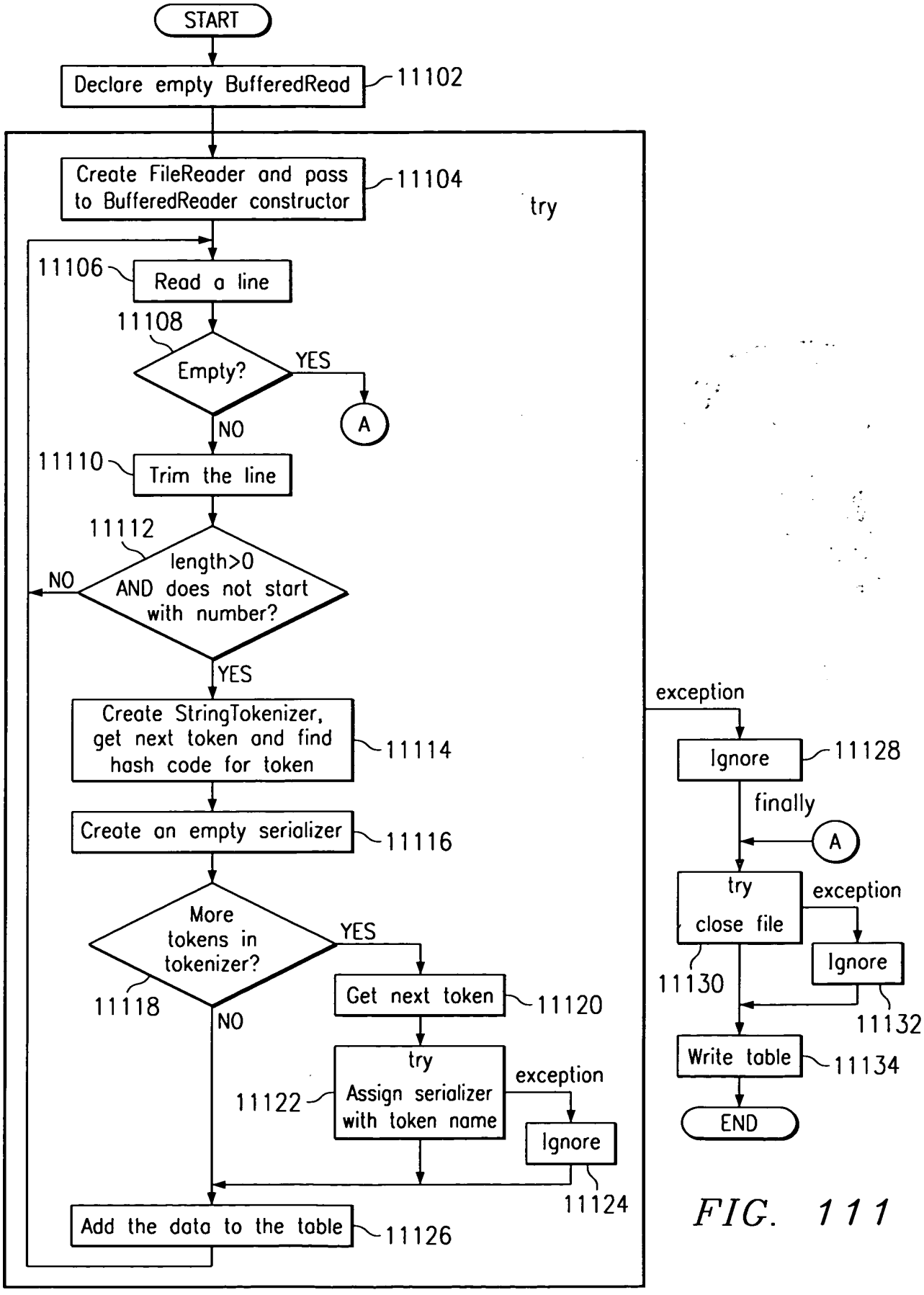

START
Declare empty BufferedRead
11102
Create FileReader and pass to BufferedReader constructor
11104
try
11106
Read a line
11108
Empty?
YES
A
NO
11110
Trim the line
11112
length>0 AND does not start with number?
NO
YES
Create StringTokenizer, get next token and find hash code for token
11114
Create an empty serializer
11116
More tokens in tokenizer?
YES
11118
NO
Get next token
11120
try
Assign serializer with token name
11122
exception
Ignore
11124
Add the data to the table
11126
exception
Ignore
11128
finally
A
try
close file
exception
11130
Ignore
11132
Write table
11134
END

FIG. 111

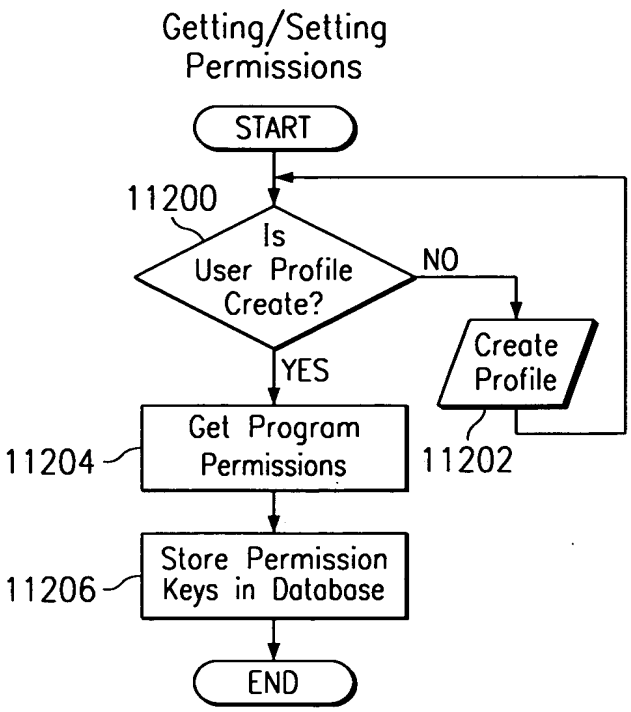


FIG. 112

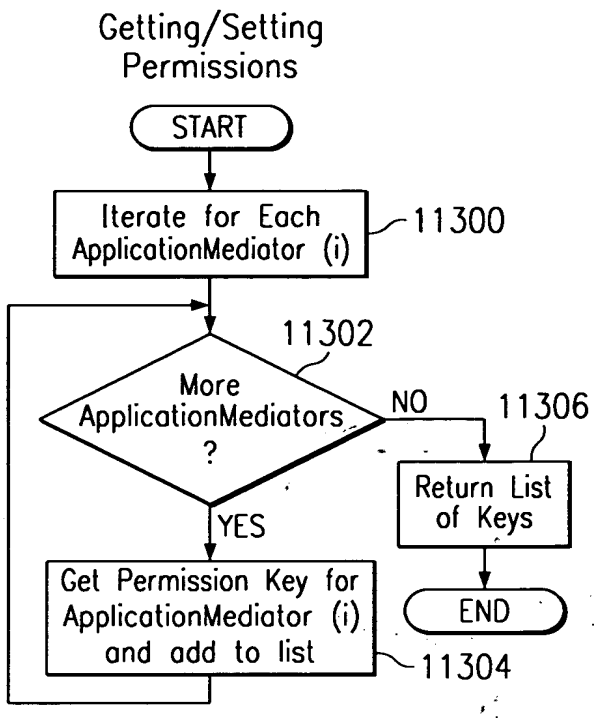


FIG. 113

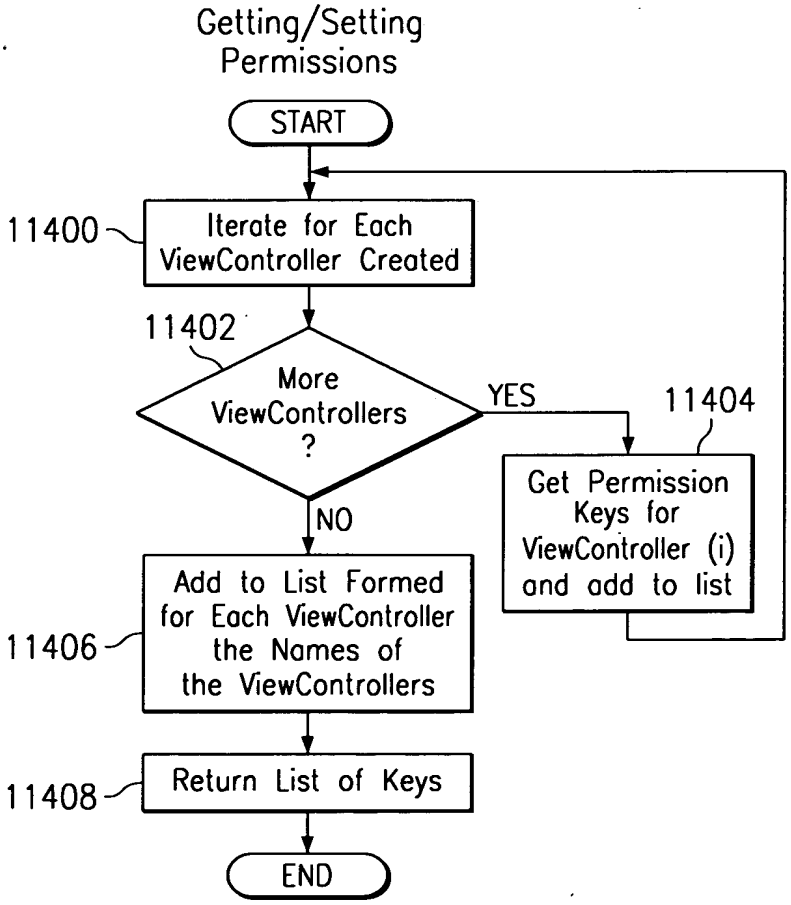


FIG. 114

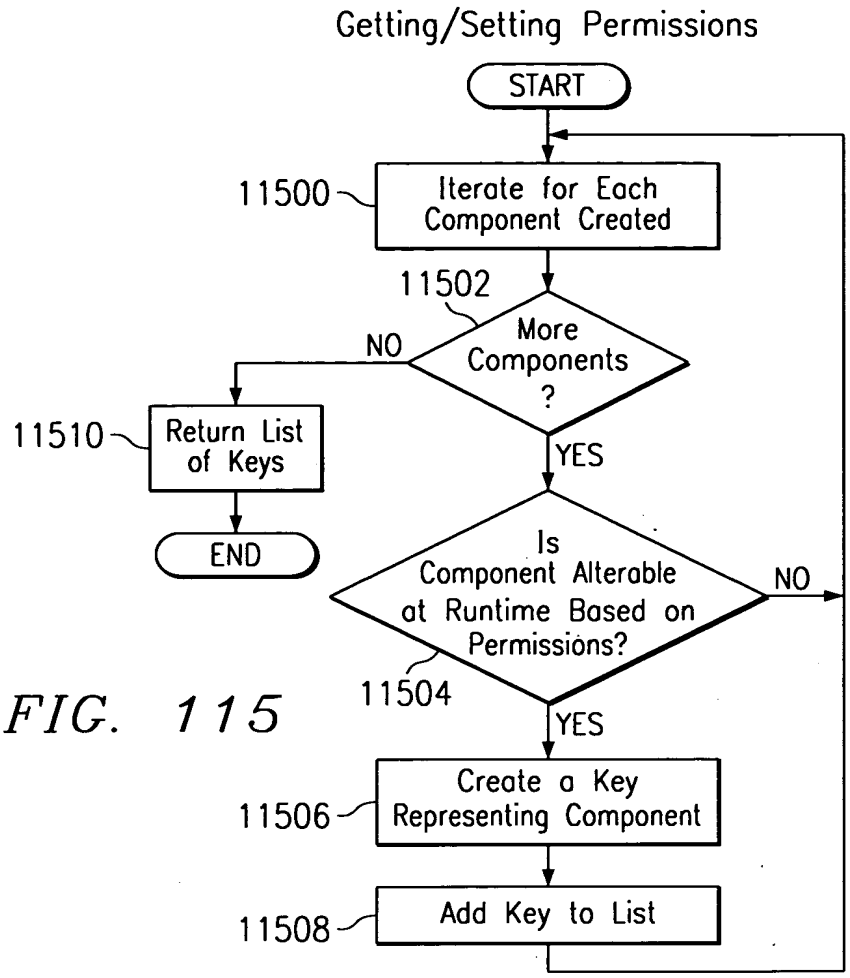


FIG. 115

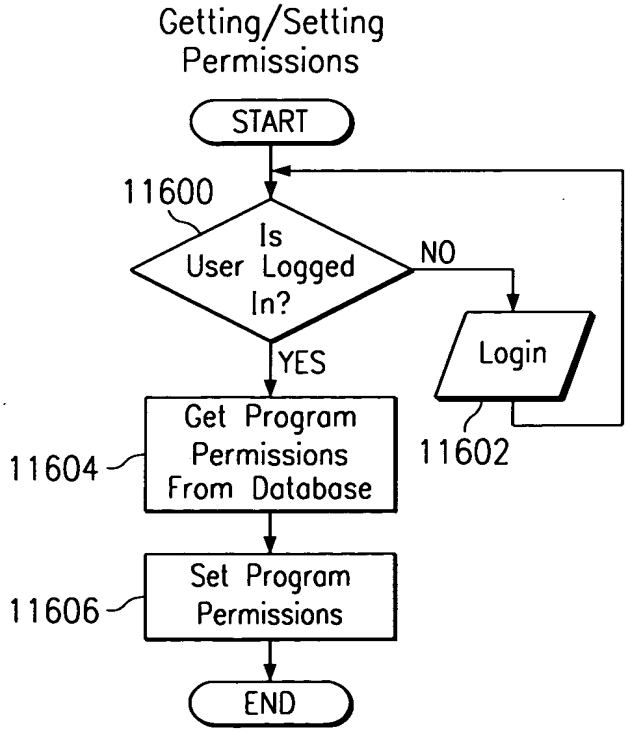


FIG. 116

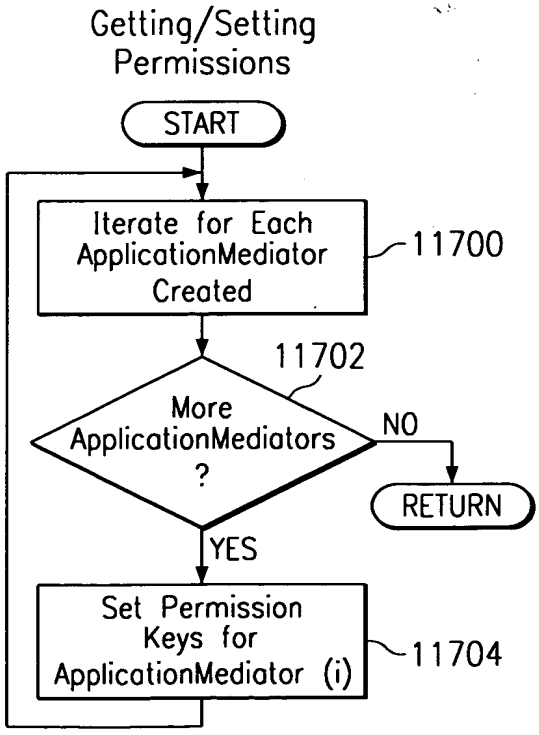


FIG. 117

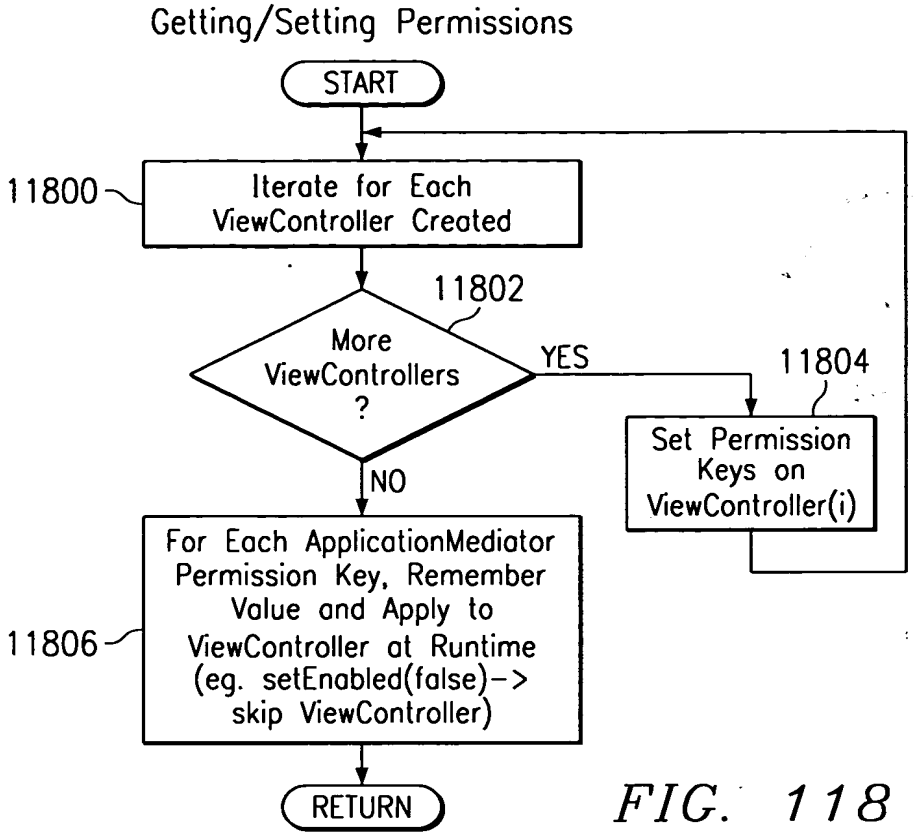


FIG. 118

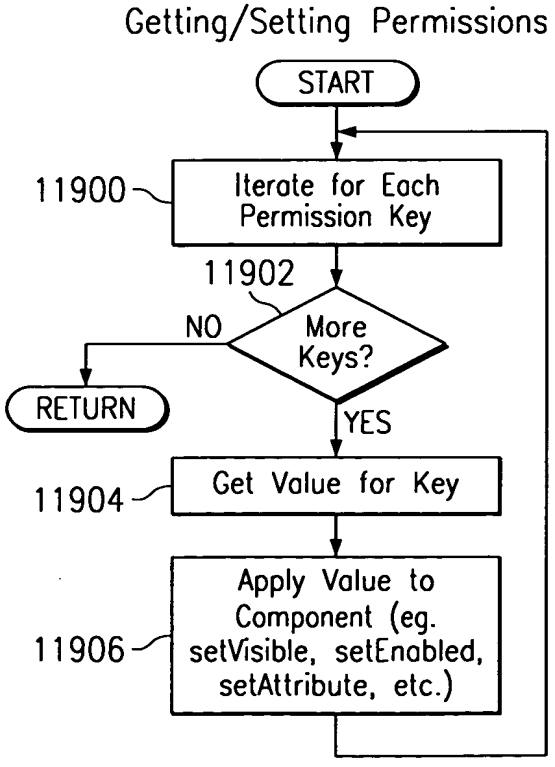


FIG. 119

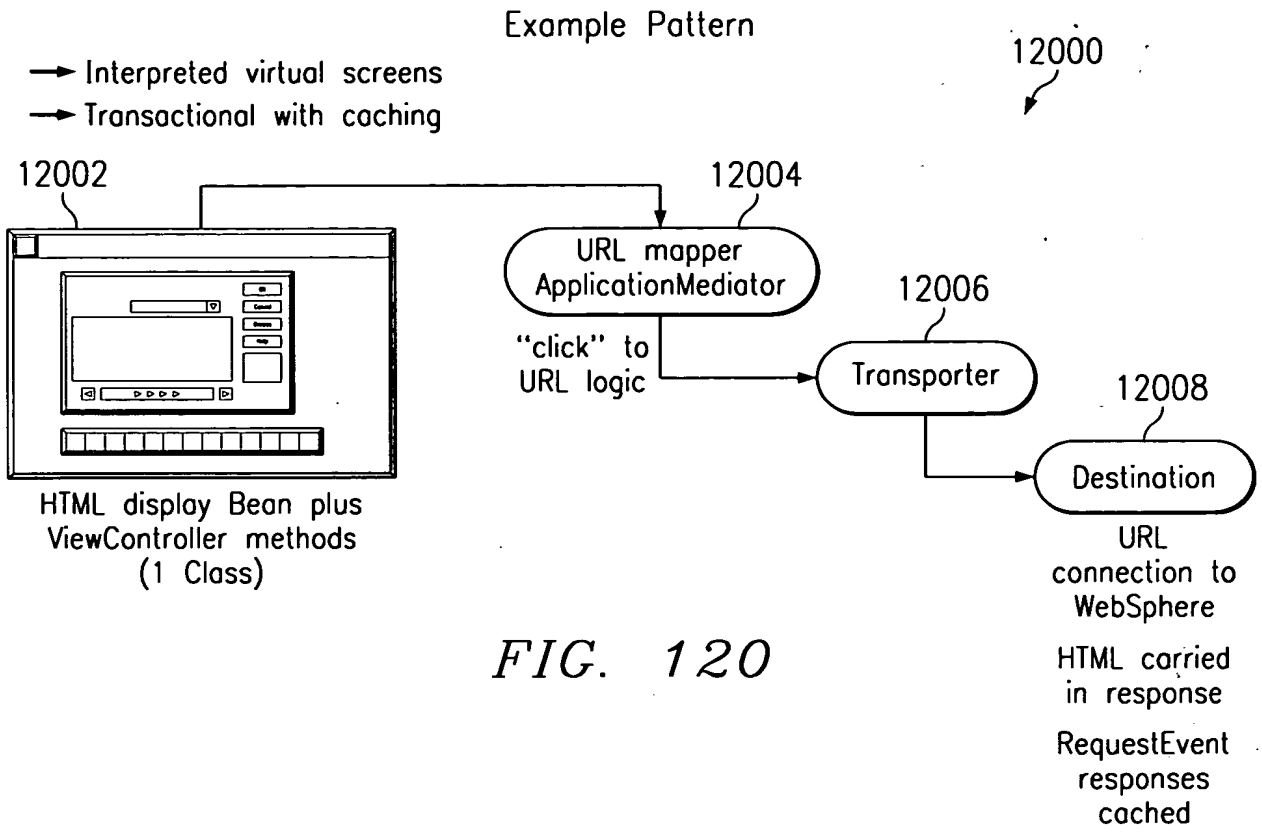


FIG. 120

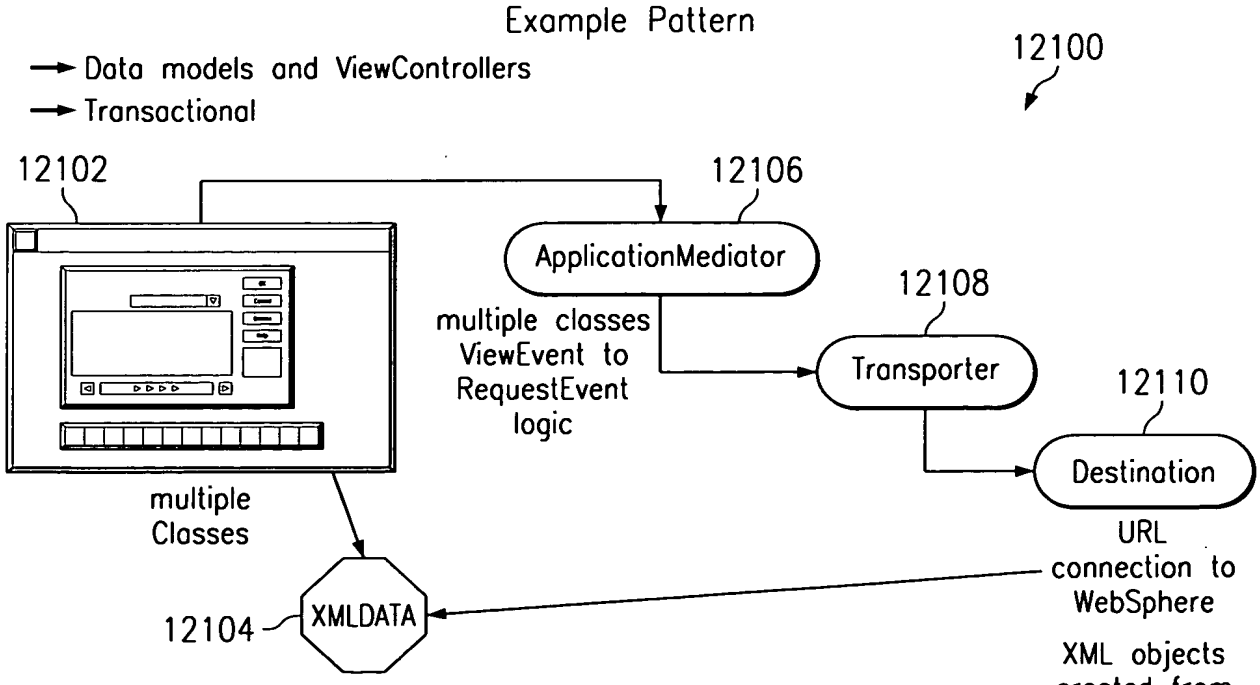


FIG. 121

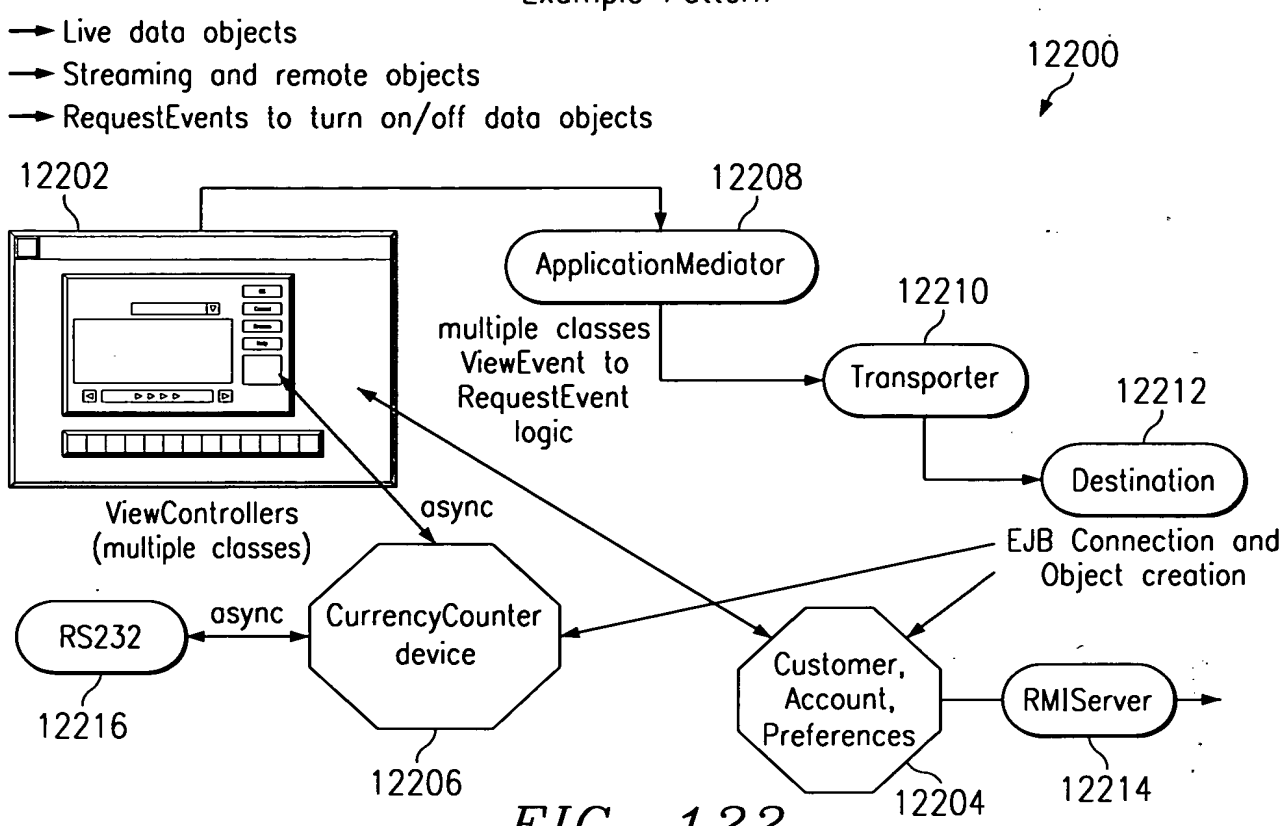


FIG. 122

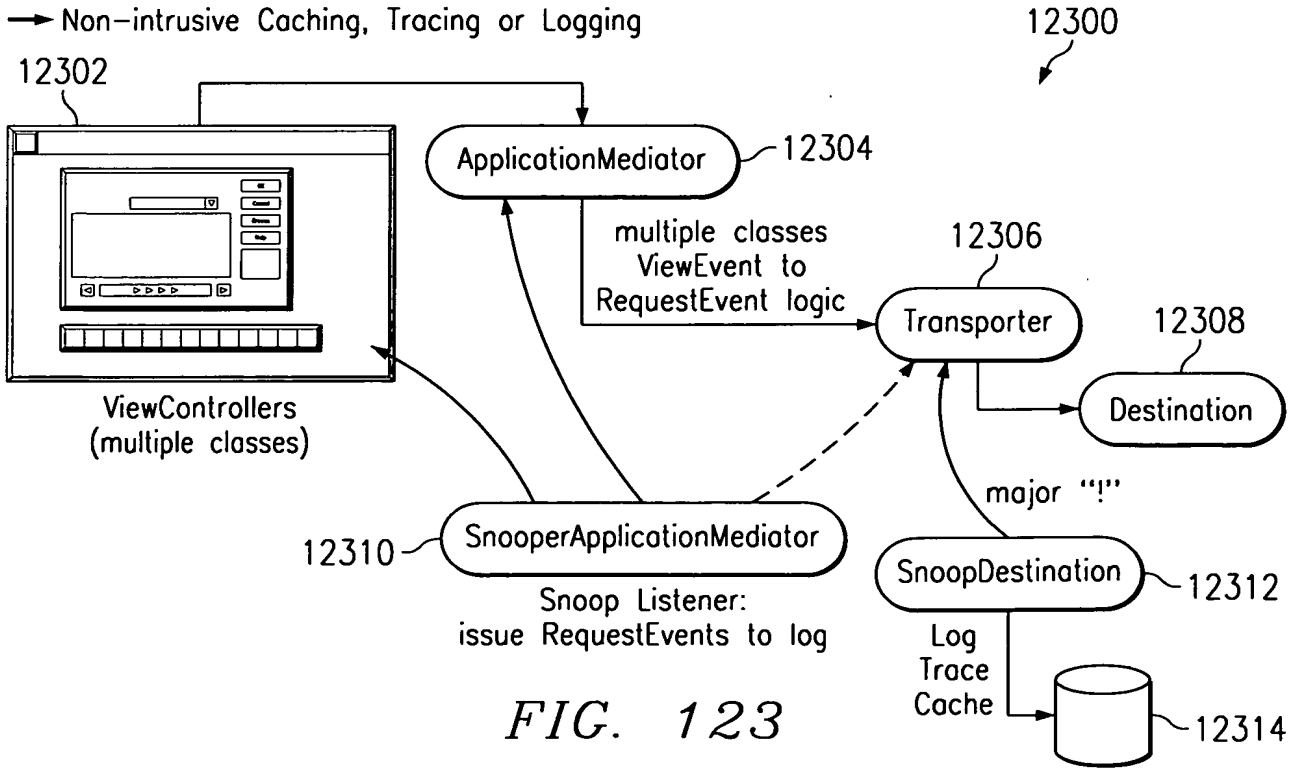


FIG. 123